Chemical Age 1 July 1950 WITH METALLURGICAL SECTION

The Chemical Age

VOL LXIII 1 JULY 1950 No 1616

INDEX TO ADVERTISERS IN THIS ISSUE

'ALKATHENE' Tube in the chemical industry

To the chemical engineer, 'Alkathene' tube offers these important advantages :—

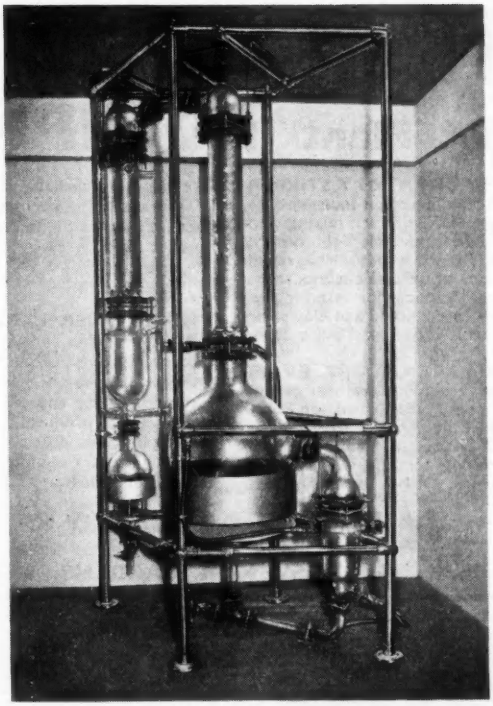
- Unaffected by most corrosive fluids up to 65°C.
- Light in weight—specific gravity 0.92.
- Tough, durable and flexible.
- Easy to joint and weld.
- Available in long continuous lengths.
- Very low thermal conductivity.

Write for details to the nearest I.C.I. Sales Office.

'Alkathene' is the registered trade mark of polythene manufactured by I.C.I.

IMPERIAL CHEMICAL INDUSTRIES LIMITED
LONDON, S.W.1

P.400



All glass vacuum still

Glass assists Industrial Production

A new technique in glass fabrication has brought the advantages of laboratory practice to the aid of the manufacturer. Cleanliness can be ensured by visual inspection at the commencement of production and at changeover. Internal processes can be visually observed to the advantage of quality and control. If you feel that such equipment has possibilities for you, write and tell us. We shall be pleased to be constructive in any phase of the application of the equipment.

Write for our illustrated catalogue "Industrial Plant in Glass."

QUICKFIT & QUARTZ LTD.

INTERCHANGEABLE LABORATORY GLASSWARE
INDUSTRIAL PLANT IN GLASS

Head Office: **1 ALBEMARLE STREET, PICCADILLY, LONDON, W.1.** *Phone: Regent 8171*

"Quickfit" Works, Stone, Staffs. Phone : Stone 481.

The
Chemical Age

The Weekly Journal of Chemical Engineering and Industrial Chemistry

BOUVERIE HOUSE 154 FLEET STREET LONDON E.C.4
Telegrams: ALLANGAS FLEET LONDON · Telephone: CENTRAL 3212 (26 lines)

Volume LXIII 1 July 1950 Number 1616

Misuse of Farm Chemicals

THE alarming feature of the toxicity to human beings of DNOC (3:5 dinitro-*ortho*-cresol), of which tragic evidence was given by the sudden deaths of two agricultural spraying workers (page 7 this issue), is the paucity of medical knowledge of biological aspects, and hence of the remedial measures when users have neglected the elementary safeguards. It needs little reflection to appreciate that in the conditions in which DNOC and a number of other toxic agricultural substances will often be used the simplest precautions to render them harmless will inevitably be disregarded at some time or other. Agricultural workers cannot be supervised as effectively as factory workers, and when there is negligence medical science, it would appear, is helpless to avert the results. These, as the facts of the Yorkshire fatalities show, may be sudden and disastrous.

Those are among the reasons why this event was given by some national newspapers a "scare"-rating and corresponding treatment, from which many who know nothing about DNOC —or DNC, as it is commonly called by users—may infer that the stuff can be classed in respect to its danger to human beings with the powerful arsenicals or the cyanide of potassium which farmers use to destroy wasp nests. This is demonstrably nonsense, but it would be surprising if that belief has not taken root in some quarters.

The calamitous possibilities of DNOC were not less known than were the poisonous effects of the cresol disinfectants, the drinking of which used once to figure fairly frequently in the evidence of suicide cases. It is generally agreed that there have now been six fatalities, including those in Yorkshire, which can with fair certainty be attributed to the use of DNOC in agriculture. There is no element of unknown hazard here, excepting the generally innocuous character of the substance, like that of a host of other "poisons" which 99.9 per cent of their users employ with no ill effect.

DNOC is not new. During approximately 15 years it has been in common use as a winter wash for fruit trees it has established a reputation as a harmless and effective insecticide, used in a concentration only one-sixth to one-tenth as strong as the solution employed for weed killing. Its use against weeds has been widespread only for about six years, during which its

On Other Pages

The annual subscription to THE CHEMICAL AGE is 30s.; single copies, 9d.; post paid, 1s. SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street Birmingham (Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited

usefulness has been so fully established that very few farmers would be willing to dispense with it. Too many, unfortunately, do not appreciate that there is a very different element of risk in using a weak concentration in winter conditions, when absorption through the skin is much less likely, and spraying a much stronger solution when summer heat makes the wearing of stuffy protective clothing and rubber boots an acute hardship. Reassured by the knowledge that a good deal of wetting with DNOC has produced no noticeable effect, the spray operator is subjected to the strongest possible temptation to take a chance. It has to be recognised that this sort of occasional foolhardiness is likely to persist as long as this and a large and increasing group of agricultural chemicals are used and the conditions in which they are distributed and applied will have to be adjusted to minimise the possibility of carelessness. A responsible and realistic attitude to a somewhat similar danger, of a graver kind because it could damage the many who consume a crop, not only those who tend it, is the stringent control of the use of the organic phosphorus insecticide Pestox 3. That, however, is a relatively simpler problem because of the more definite nature of the hazard associated with a phosphorus compound, which rules out its distribution to all and sundry. DNOC, on the other hand, can be had by anyone and so also can a lengthening list of chemicals for field or garden, several of which are conspicuously more hazardous than dinitro-*ortho*-cresol. To prohibit their use would be a stupidly retrograde step, assuming that it were possible, comparable to grounding all civil aircraft to prevent the destruction which results—far more frequently—from air accidents.

The possibility now arises, however, that compulsory safeguards will have to be established to avert the results of ignorance or reckless use of the newer agricultural chemicals. That the Ministry of Agriculture is aware of the need for action is indicated by the recent publication of warning notices to users of DNOC and the phosphorus formulations, and the current decision to call a conference on July 11 of all the interests concerned.

Notes and Comments

European Coal and Steel

AMID the political uproar here which has followed the recent somewhat abrupt presentation to the world of the Schuman plan to co-ordinate European production of coal and steel comparatively little attention seems to have been paid to the likely effects of some such agreement on British steel and coal programmes, whether the Government participates or abstains. It is hard to avoid the conclusion that the U.K. approach to this proposal, the need for which has been foreshadowed by the uncoordinated "steel drive" in most countries since the war, would have had a more rational background but for the Socialist conviction that coal and steel in Britain are actually or potentially departments of State. That belief appears to have inspired at least some of the repugnance evidently felt by some Government supporters to the possibility of surrendering what is called "national sovreignty" in this connection.

A Natural Development

WHATEVER the merits and defects of a "supra-national" body influencing the development of the numerous plans to overcome an apparently chronic steel shortage, it seems unlikely now that abstention by Britain alone would divert the aims of France and Germany and offset the general desire to see a closer understanding between them. The Schuman plan, moreover, may be regarded as an inevitable result of the grossly unbalanced resources of coal and of iron ore which will enforce some scheme of rationalisation, whether the French plan is accepted or not. Countries deficient in coking coal—the common European disability—or of iron ore and manganese have already shown evidence of their determination to remedy their troubles by the obvious exchange methods. The best function of the Schuman plan would be to facilitate that natural process and ease the tensions which are bound to arise if such factors as the mounting production of the Aachen and Ruhr coalfields —expected to reach 400,000 tons daily this autumn—are not treated realistically. The inevitability of what is now being proposed from France might well have been foreseen. There would then have been less prospect of a divorce of British coal and steel from the European economy, which is now an unwelcome possibility.

Themes of the CRL

SURE, if unspectacular, advances upon the work shown in 1949 were seen by the Press when they visited the DSIR Chemical Research Laboratory at Teddington on June 27. Perhaps the most interesting exhibits this year were those of the microbiological department, which is showing vigorous leadership in the field of non-pathogenic cultures for the use of industry. One of the predominant themes in this department continues to be the study of sulphate-reducing bacteria and the stimulants and inhibitors of their growth, with the addition of selenates for competitive inhibition. Also under survey are sulphur-oxidising bacteria and the internal and external corrosion of buried ferrous pipes.

Industrial Bacteria

BACTERIA are being increasingly used in many industrial processes, from the production of yoghourt to the manufacture of solvents. The Chemical Research Laboratory, recalling this, is reminding industry of its own national collection of industrial bacteria, which was founded early this year. It took over the non-pathogenic cultures held by the National Collection of Type Cultures at Colindale and now houses some three hundred and fifty types, with the expectation of a considerable increase as the collection becomes more representative of the needs of industry.

The laboratory will maintain any organism which has ceased to be of interest but which may be wanted later. It frequently happens that a particular organism is destroyed when it has fulfilled its temporary purpose and yet may be required in the future at short notice. The laboratory will also maintain any duplicate organisms. Most of the non-pathogenic bacteria supplied by Colindale can be obtained and CRL will try to procure any type of non-pathogenic culture which it does not hold itself. In time, it is hoped that the collection will become comprehensive by obtaining cultures from other laboratories in this country and abroad, with particular emphasis given to assay organisms.

"The State Can't Do It"

WHILE few chemists in these days have the leisure to consider at length the eventual effects of national policy upon social and economic affairs, some, among the guests of the Society of Individualists at an anniversary luncheon in London on June 22, heard such trenchant and reasoned criticisms of current affairs that they had every cause to abandon the common attitude of neutrality. Speakers of the calibre of Dr. C. K. Allen and Sir William Darling gave the most convincing account of the principle of allowing full scope to the individual to make the best use of all the energy and talents he possesses, a practical aspiration which nearly all scientific workers share and all the more successful achieve for themselves. The movement, which grew up round the nucleus of the Individualist Bookshop, was celebrating its 25th birthday and the 75th birthday of Sir Ernest Benn, one of its founders and its most formidable protagonist from its earliest days. He gave the Individualists a revealing picture of the decline, since about 1910, of the nation-wide preference for managing ones own affairs and making the most of individual gifts, which in the sciences, incidentally, was the background of most of the significant advances. Notwithstanding the benevolent participation of some Government departments in several sections of science and technology, the outcome has not in the least invalidated Sir Ernest Benn's declaration that "The State can't do it". There have been few more conspicuous examples of fruitful individualism that the former secretary of the DSIR. His tradition of scope and responsibility for individual workers continues to provide most of the impetus of wide-ranging research projects.

Oil Shale

SCIENTISTS are coming from Europe, the British Commonwealth and the U.S.A. to meet their British counterparts at the Second Oil Shale and Cannel Coal Conference in Glasgow during the first week of July. This conference, organised by the Institute of Petroleum, will be held at the Royal Technical College from July 3-7. Nearly 50 technical papers will be presented and discussed. Subjects cover the geology, mineralogy, and mining of oil shale and cannel coal, oil shale retorting, refining of shale oil and uses of by-products, including topical material concerned with some of the detergents which Scotland is producing. A programme of social events has been arranged to cover the intervals between the technical sessions, including a dinner and dance at the Central Hotel, Glasgow, a day visit to Scottish Oils, Ltd., a number of bus tours and a civic reception by Glasgow Corporation. The start of the conference coincides with the official opening of the new "Young" research laboratories in the technical college. These commemorate James Young, who figured prominently in the establishment of the Scottish shale oil industry. A reception has been arranged by the governors of the college for the members of the conference, at which Dr. W. M. Cumming, O.B.E., will deliver the "Young" centenary lecture, after which the new research laboratories will be officially opened.

Cortisone Distribution in U.S.A.

The first widespread distribution of cortisone for control of rheumatic diseases was made in the U.S.A. last week when the drug was made available to hospitals.

CHEMISTRY & METALLURGY AT HARWELL

Study of Materials in Novel Conditions

MANY interesting scientific problems have been tackled and considerable progress made at Harwell since the last Press visit to the Atomic Energy Research Establishment nearly two years ago. The important part played by chemical engineering and metallurgy during that period was emphasised at a Press visit last week which served to reveal some of these advances.

A primary task at the moment is to make possible the economic use of low-grade ores and both the chemical laboratories and the metallurgical department are engaged in experiments with regard to extraction.

The metallurgists are also studying new reactor materials, and encouraging progress has been made in the production of beryllium shapes. Another potentially useful metal is zirconium, but this is difficult to prepare sufficiently pure. The chemists have, however, worked out a very promising method for doing this, which is capable of development on a production scale.

Liquid metals may be used in new reactors, and the engineers are studying the heat transfer problems at the very high transfer rates that will be required. They and the chemical engineers are also studying with test rigs the problems of circulating liquid metals in closed circuits.

It has been found that chemical reactions occur more readily in the conditions inside a pile. Care has therefore had to be taken lest graphite, for example, oxidises too readily and disperses in the cooling air; whenever two different materials are used in contact their reactions have to be tested in these conditions.

Interesting Scientific Problems

The effects of the bombardment which goes on inside a pile on the mechanical, electrical and thermal properties of all materials which will be used in future in reactor construction have been studied. There are many interesting scientific problems here. For example, when quartz is exposed inside a pile it is turned from a crystalline substance into a glass. When diamonds are exposed in a pile they become coloured.

The chemists are also studying the effects of pile radiations on the disarrangement and rearrangement of molecules. If a mixture of benzol and water is irradiated, phenol-dihydro-oxy-benzene and other complex products are produced.

The graphite used in the construction of a pile is itself an important material, acting as a moderator, slowing down neutrons to the velocities needed for efficient operation. Heavy water and beryllium are other examples, but there are engineering and supply problems which seriously limit their use. The graphite required for a nuclear reactor must not contain impurities which absorb neutrons and must be robust if it is to form part of the reactor. Research to improve graphite technology is continuous.

Chemical Engineering

Solvent extraction of inorganic materials is another problem of the chemical engineering section. For proper understanding of the manner in which material is transferred from an aqueous solution into an organic solvent it is necessary to know something of the behaviour of liquid droplets in passing through another liquid.

In the solvent process laboratory apparatus is designed so that photographs can be taken of the droplets entering and leaving a column packed with rings. The photographs are taken with an exposure of 200 microseconds and after development are examined to determine the average volume and surface area of the droplets.

Many inorganic materials can be extracted from their aqueous solution in organic solvents. Ether extraction of uranium salts from aqueous solution has, for example, long been known and made use of in the purification of uranium.

In the development of nuclear energy for industrial use, metallurgical research is faced with many problems of high temperature engineering projects and several problems peculiar to nuclear reactors.

The Press party was shown an argon arc furnace, in which metals of the highest melting point can be melted. The unique characteristic of this furnace is that no special containers or crucibles in which to melt the metal are required, and contamination of the melt is thus avoided.

A second exhibit showed an unusual method of measuring small strains (of the order of one ten-millionth) in metals. Essentially, a constant flow of air is main-

(continued overleaf)

Aluminium Works Explosion

Experimenting with Carbon Tetrachloride

A VERDICT of "Accidental death" was returned at the inquest last week, at Banbury (Oxon), on John Parker Bell and Albert Payler, employees at the works of the Northern Aluminium Co., Ltd., who were killed as the result of an explosion there on May 18. The coroner (Mr. W. P. Haines) commended Mr. Jack Brown for his brave action in rescuing, at the risk of his own life, a third man, Mr. Charles Clack, from the burning building.

A chemist at the works, in evidence, stated that his department was experimenting for the first time with carbon tetrachloride in connection with the making of aluminium paste when the explosion occurred. He had made extensive inquiries before the experiments to find if there was any chemical reaction between carbon tetrachloride and aluminium when dry, but found none.

Mr. S. H. Wilks, senior chemical inspector, H.M. Factory Inspectorate, said that although he and all authorities believed that the two substances together were passive, it had been found that a small pamphlet issued in the U.S.A. in 1945 stated that under certain conditions the substances would produce an explosion. He also mentioned an experiment carried out by the Director of Armaments Research, when the two substances exploded with the force of dynamite. In that experiment there had been used 30 per cent aluminium and 70 per cent carbon tetrachloride in a steel tube held down by 300-lb. weights and ignited by detonation. The steel tube was concertinaed against the wall of the explosion chamber. It was just such an explosion which happened in the experimental ball mill at the N.A.C., but what happened in the mill to fire the mixture he did not know.

The inspector said they had already notified all factories likely to deal with those two substances, and the makers of carbon tetrachloride were inserting a warning notice in their handbooks, and His Majesty's inspectors had been warned to stop all such processes.

CHEMISTRY & METALLURGY AT HARWELL

(*continued from previous page*)

tained between two parallel plates attached to the specimen under test. The pressure drop between the points of entry and exit of the air current to the plates depends upon the size of gap between the plates. Thus when the test specimen lengthens under load the gap between the plates increases by the same amount and the air pressure drop decreases. In one exhibit, the change in pressure was recorded by the indicator.

This technique has been developed for measuring small movements in metals under stress in a pile, where only remote methods of measurement are possible and conventional methods might be disturbed by pile irradiations.

Some of the special metals under investigation by the metallurgy division for thermal reactors were also on view. These included uranium, beryllium and zirconium.

Electrodepositors' Technical Society

The balance sheet and accounts of the Electrodepositors' Technical Society for the session ended August 31, 1949, shows a surplus of income over expenditure of £549 14s. 11d.

Safe Use of Agricultural Chemicals

A CONFERENCE to discuss the adequacy of the usual precautionary methods in the use of chemicals in agriculture has been arranged by the Ministry of Agriculture to take place on July 11.

This was announced on Tuesday following a discussion on the safety of operators between the Ministry of Agriculture and Fisheries and representatives of the TUC. The Ministry, recalling its warning notices of March 28 and April 13 on the precautions required in the use of DNOC and phosphorus weed-killers and insecticides, stated that further close attention had been given to the use of chemicals in general agriculture with reference both to their effects on the crops and the hazards to those using them.

Representatives of farmers, manufacturers and contractors have been invited to attend the conference.

Evans' Acquisition

Evans Medical Supplies, Ltd., has acquired the entire share capital of its Newcastle agents, Phillips Spencer, Dakers & Co., Ltd., which from July 1 will trade as a wholly-owned subsidiary. Mr. N. McQueen has been made general manager.

TWO KILLED BY DNOC

Jury Urges Expert Investigation

A JURY at a Richmond (Yorks.) inquest on June 21 recommended that the practice of using dinitro-ortho-cresol weed killer (DNOC) in hot weather should be the subject of consideration "by the highest authority."

The jury, inquiring into the deaths of two agricultural spraying operatives, heard a medical witness's opinion that no specific treatment existed for DNOC poisoning. The jury returned a verdict that death was caused by poisoning by dinitro-ortho-cresol received while the men were following their occupation and added the rider referred to.

The two men, Edward McFadden (25) and Thomas Brown (23), both of Blairgowrie, Perthshire, Scotland, were employed on seasonal work weed spraying for the Chafer Spraying Co., Ltd., Doncaster. They had been spraying DNOC at Sandwath Farm, Forcett, when McFadden died on the roadside and Brown died at the Darlington Memorial Hospital later the same day, June 6.

Dr. A. F. T. Ord, of Aldborough St. John, said that when he saw the body of McFadden lying by the roadside, the skin was yellow on his arms, body and head and his hair was yellow. Death appeared to have been instantaneous. Later, Brown was brought to his surgery. He was sweating profusely and his skin was yellow, but there was little to suggest he was acutely ill.

No Known Treatment

Dr. Michael Kelly, formerly of Darlington Memorial Hospital, said Brown's condition deteriorated rapidly after admission and it was probable that he had absorbed dinitro-ortho-cresol through the skin. Asked by Mr. O. H. Parsons, representative of the National Union of Farm Workers, whether there was any treatment in such a case, Dr. Kelly replied, "Probably not because there is not much known about it. There is no known way of being certain there is any specific treatment."

Mr. Richard R. Crute, representing Chafer Spraying Co., asked whether Dr. Kelly knew that the Ministry of Agriculture pamphlet stated the substance could be poisonous only if taken internally. Dr. Kelly: Our conclusion was that in the extreme heat of the day it probably could be absorbed.

Harry Roy Savage, supervising engineer of the Chafer Spraying Co., said McFadden and Brown joined them on May 10 and were supervised on their first job on a farm after four days' training. They were both efficient and had had about 14 jobs before going to the farm at Forcett. The witness said: "We read to them a circular on the danger if not handled properly of the material they would use, and a copy was given to them. The circular warned that if excessive perspiration, thirst, fatigue and loss of weight were felt, work should stop and not be continued until a medical test was passed. It gave a warning to wear protective clothing. We have not taught that there is more risk in hot weather than in cool weather."

Rubber Clothing

The two men had had protective clothing issued to them—rubber boots, rubber apron, rubber gloves and eyeshield.

Dr. H. J. H. Payne, pathologist of the public health laboratories, Northallerton, said that a post mortem on the men revealed that the cause of death in both cases was dinitro-ortho-cresol poisoning.

The poison was accumulative and excreted slowly. It entered the system by ingestion, inhalation or through the skin and it was important that protective clothing was worn when the material was used. No drug had yet been found to counter the effects of the poison. He thought this kind of poison was more likely to occur in hot weather than in other temperatures. All the deaths which had resulted from the poisoning in this country had been in hot weather. Five people had died as a result of spraying operations and a sixth victim was engaged in industry.

The coroner commented that the tragedy appeared to have resulted through the men becoming careless in regard to protective clothing. More frequent inspections of employees engaged on spraying might be advisable and the question of temperature might require consideration.

Protective Industrial Gloves

No satisfactory definition for the purpose of exempting industrial gloves from purchase tax has yet been devised, according to a written answer by Mr. Douglas Jay, Financial Secretary to the Treasury. Representations that the tax on all sheepskin gloves should be reduced from 100 to 33⅓ per cent were under consideration.

Chemical Exports Exceed £8.5m.

Marked Improvement in May Figures

THE official records of exports of chemicals, drugs, dyes and colours in May have disclosed a widespread improvement, contributing to a total of £8,508,103. That is £416,354 more than the same month of 1949, and £1,379,351 greater than April this year. Outstanding increases compared with May, 1949, were: lead acetate 11,481 cwt. (4336); tetra-ethyl lead 118,654 gal. (90,841); sodium sulphate 89,355 cwt. (46,698). Value of plastic materials was £723,880 compared with £427,989 in 1949 and big exports of copper and copper manufactures and unwrought tin, brought the value of non-ferrous metal exports to a new monthly record of £6,736,287.

	May, 1950	May, 1949
Cresylic acid	Gal. 253,649	Gal. 60,627
Salicylic acid and salicylates	Lb. 125,545	Lb. 173,534
Value of all other sorts of acid	£149,389	£145,083
Sulphate of alumina	Tons 3,945	Tons 2,369
All other sorts of aluminium compounds	644	1,502
Ammonium sulphate	23,446	32,386
Ammonium nitrate	3,851	10,644
All other sorts of ammonium compounds	1,441	1,680
Bleaching powder	Cwt. 43,299	Cwt. 33,022
All other bleaching materials	9,500	7,732
Collodion cotton	2,668	4,258
Copper sulphate	Tons 5,137	Tons 4,643
Disinfectants, insecticides, etc.	Cwt. 37,643	Cwt. 42,235
Fertilisers	Cwt. Tons 1,714	Cwt. Tons 832
Value of gases (compressed, liquified or solidified)	£27,731	£20,653
Lead acetate, litharge, red lead, etc.	Cwt. 11,481	Cwt. 4,336
Tetra-ethyl lead	Gal. 118,654	Gal. 90,841
Magnesium compounds	Tons 936	Tons 873
Nickel salts	Cwt. 5,485	Cwt. 6,214
Potassium compounds	8,038	5,227
Salt	Tons 20,393	Tons 23,479
Sodium carbonate	Cwt. 258,893	Cwt. 299,649
Caustic soda	307,353	254,561
Sodium silicate	29,150	20,465
Sodium sulphate	89,355	46,698
All other sodium compounds	100,768	80,739
Tar oil, creosote oil, anthracene oil, etc.	Gal. 1,839,941	Gal. 4,077,401
Zinc oxide	Tons 532	Tons 950
Total value of chemical manufactures (excluding drugs and dyestuffs)	£4,594,578	£4,504,460
Value of quinine and quinine salts	£31,745	£32,726
Acetyl-salicylic acid	Lb. 210,057	Lb. 116,877
Insulin	100 International Units 1,722,903	100 International Units 951,170
Penicillin	Mega Units 1,082,898	Mega Units 577,961
Total value of drugs, medicines and preparations	£1,786,619	£1,790,990
Total value of dyes and dyestuffs	£1,013,089	£757,876
Total value of paints, pigments, colours, etc.	£1,113,817	£1,038,423
Plastic materials:	Cwt.	Cwt.
Synthetic resins, solid and liquid, including adhesives	24,445	15,486
Moulding powders	20,591	8,691
Sheet, rod, tube, film and foil—		
Laminated	2,287	1,705
Non-laminated: cresylic	3,307	1,951
celluloid	874	1,169
other sorts	3,465	3,097
Total value	£723,880	£427,989
	Cwt.	Cwt.
Chemical glassware	2,031	1,483
Value	£63,703	£53,415
	Cwt.	Cwt.
Fans	4,345	3,369
Value	£117,501	£100,074
	Cwt.	Cwt.
Furnace plant	10,968	6,546
Value	£119,011	£75,713
	Cwt.	Cwt.
Gas and chemical machinery	22,338	16,817
Value	£325,238	£185,491
Scientific instruments: Optical		
Value	£67,888	£96,110
Thermometers, mercury in glass, etc.		
Value	£39,783	£38,568
	Cwt.	Cwt.
Air and gas compressors and exhausters	15,197	14,862
Value	£302,723	£292,846
Non-Ferrous Metals:	Cwt.	Cwt.
Aluminium and aluminium alloys	93,119	134,494
Value	£1,113,544	£1,397,059
	Lb.	Lb.
Bismuth metal (not including alloys)	50,899	32,014
Value	£36,971	£16,850
	Tons	Tons
Copper	8,171	7,493
Value	£1,528,053	£1,264,509
	Tons	Tons
Lead, unwrought	23,844	14,843
Value	£394,064	£174,167
	Tons	Tons
Tin, unwrought	1,897	108
Value	£1,131,875	£63,161
Total value non-ferrous metal group	£6,736,287	£5,365,602

Crude Black Molasses from Australia

The Board of Trade announces that it is prepared to consider applications for licences to import from Australia crude black molasses with a sweetening content not exceeding 60 per cent packed in containers of not more than 20 lb. net.

NEW I.C.I. RESEARCH CENTRE

Pharmaceutical Developments

TO obtain suitable facilities for their rapidly growing research and administration, Imperial Chemical (Pharmaceuticals), Ltd., has purchased 350 acres at Alderley Park, near Manchester. Building work on the site is expected to begin in 1951, the first laboratories may be occupied in about three years time. Many of the employees will be highly qualified scientists, to be recruited from all parts of the country. But the largest requirement will be young men and women as assistants to the scientific staff, and it is hoped to recruit these from neighbouring areas such as Macclesfield, Alderley Edge and Wilmslow. Those who prove capable will have opportunities for promotion from the assistants' to the scientists' grades.

Of the total area 150 acres consist of woodland and water, and will not be disturbed. Only a small proportion of 1200 acres of parkland will be allocated to buildings. The remainder will be used for grazing cattle required for the research programme. This programme can only be carried out in a clean atmosphere and under first-class agricultural conditions, and any industrialisation on or near the site would be detrimental.

The growth of Imperial Chemical (Pharmaceuticals), Ltd., since the war has been exceptional. Founded in 1942, the company is now considered to be the third largest producer of pharmaceuticals in the country and has acquired international distinction in the medical and veterinary fields.

Among its outstanding contributions to medicine have been Paludrine, the antimalarial, Sulphamezathine, a sulpha drug which combines powerful action with a high degree of tolerance by the patient, Kemithal sodium, a new intravenous anaesthetic, and Trilene, a safe and simple analgesic. I.C.I. was also one of the first companies in the world to produce penicillin on a commercial scale and, in the veterinary sphere, its recent production of Antrycide promises to give a large measure of control of trypanosomiasis.

Merz Patents Move

The new address of Merz Patents, Ltd., is 34 The Boulevard, Wylde Green, Sutton Coldfield. Tel. Erdington 5331. The Technical Office and Laboratory is at Westwood Road, Witton, Birmingham 6, and the London office is 10a Queensway, W.2.

ANALYTICAL CHEMISTRY

International Congress in 1952

IT has been decided that the meetings of the 1952 International Congress on Analytical Chemistry shall be held in Oxford, commencing on September 4. Accommodation will normally be provided in colleges, but some hotel accommodation will also be available. The technical sessions will take place in one of the main university buildings. The period of the congress will include a week-end during which excursions and visits will be made.

The arrangements for the congress are in the hands of a general committee under the chairmanship of the president of the Royal Society, Sir Robert Robinson. Its scope is under active consideration by an executive committee, under the chairmanship of the president of the Society of Public Analysts and Other Analytical Chemists, Mr. G. Taylor.

It is expected that a meeting of the board of section 5, Analytical Chemistry, of the International Union of Pure and Applied Chemistry, will be held in Oxford during the same week. Sir Ian Heilbron is honorary president and Professor C. J. van Nieuwenburg president of section 5. The honorary secretary is Mr. R. C. Chirnside, Research Laboratories, The General Electric Co., Ltd., Wembley.

£1 m. Phosphorus Project

A PLAN to construct a £1 m. factory for the production of phosphorus at Portishead, near Bristol, has been announced by Albright and Wilson, Ltd., Oldbury. Authority to manufacture at Portishead has been granted by the Board of Trade, and work on the factory, which will be the largest of its kind in the United Kingdom, will begin as soon as planning permission is received.

Test borings have already been made on a 20-acre dockside site and it is expected that the plant will be in full production by 1953, employing about 100 workers, including staff and scientists.

A power station capable of meeting its heavy demands adjoins the site of the new factory. All phosphate rock required at the new plant and the Oldbury works will be imported through Portishead.

The decision to build in Somerset instead of expanding the Midland factories was stated by Mr. W. B. Albright to be on economy grounds. Portishead would reduce road-haulage costs and labour problems were easier.

PARLIAMENTARY TOPICS

Reconsidering the Oil Tax

MEANS of granting tax relief in respect of white spirit and light hydrocarbon oils for industrial purposes were the subject of a question in the House of Commons last week. Sir Stafford Cripps, Chancellor of the Exchequer, in a written answer stated that if the trade interests concerned had any proposals to put forward he was prepared to consider them.

POLLUTION of the atmosphere, particularly in the area round Stoke-on-Trent, was the subject of questions by Dr. Barnett Stross. Mr. A. Bevan, Minister of Health stated that "the best possible means of prevention" were already applied and recent years had shown some improvement. Every effort would be made to see that this improvement was maintained. To a further query from Dr. Stross the Minister replied that wherever possible smokeless fuel appliances should be installed in reconditioned houses.

CONSTRUCTION of the new oil refinery at Fawley was ahead of schedule and there has been no delay due to shortage of labour, stated Mr. P. Noel-Baker, Minister of Fuel and Power, in a written answer.

QUESTIONED about the establishment of an oil refinery or storage plant by the Caltex Co. on the eastern side of Southampton Water, Mr. P. Noel-Baker, the Minister of Fuel and Power, confirmed in a written answer that a proposal for such a refinery had been approved in principle by the Government, but the precise locality was still under consideration.

"EXPERIENCE of some value" had been gained in producing combustible gas by igniting a coal seam underground at Newman Spinney, near Chesterfield, stated the Minister of Fuel and Power. Experiments would continue and a full-scale trial would be carried out in due course.

Charge on Fertiliser Stocks

A CHARGE on all stocks of fertilisers held by manufacturers and distributors acquired at the lower rates permitted by the earlier subsidy is to be made by the Board of Trade. This is the effect of the new Fertilisers Order, 1950 (No. 1039), which takes effect on July 1. This relates to all stocks of subsidised fertilisers and fertilisers made from subsidised materials "on which exceptional profit would accrue."

CLAY STUDY GROUP

Plans for International Exchanges

THE increasing use of clay as an important basic material in industry and new technological processes, particularly the U.S. production of aluminium, is thrown into relief by the formation of an International Committee for the study of clays. The object of the committee is to group together specialists in the various studies of clays, with representatives from each country to document the results and methods of clay studies.

Conferences between experts will be held from time to time, in which questions relevant to clay research will be discussed, thus enabling comparisons to be made and unification of description methods. Exchanges of reference samples and combined definition of terminology will be carried out.

Several national committees have already been formed in Belgium, France, Sweden and Great Britain. A Sub-committee was appointed in London during the recent Geological Congress, of S. Henin (France), chairman; M. Lepingle (Belgium) secretary; and R. E. Grim (U.S.A.) and D. M. C. MacEwan (Great Britain) as members. A further sub-committee has been formed to deal with the first questionnaire, on differential analysis, and the British representatives are Dr. D. M. C. MacEwan (Rothamsted Experimental Station) and Dr. G. W. Brindley (University of Leeds).

A meeting of the full committee is to be held in Amsterdam during the forthcoming International Congress of Soil Science (July 24-August 1, 1950).

Another Pyrethrum Substitute?

SCABRIN is the name of a new insecticide recently discovered by the U.S. Department of Agriculture, is an amide and is extracted from the roots of the genus *Heliopsis*, the common ox-eye daisy. Early experiments indicate that scabrin is appreciably more toxic to houseflies than is pyrethrum.

The effect of scabrin on animals and plants and on insects other than the housefly is unknown, and the technical aspects of its extraction from its weed source are not specified. The insecticidal element of pyrethrum is contained in the flowers and requires much hand labour for its recovery. A root crop might lend itself to mechanical tillage and harvesting. In this respect scabrin may be of considerable importance.

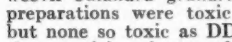
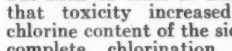
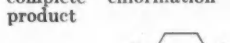
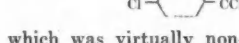
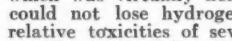
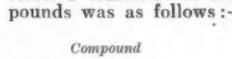
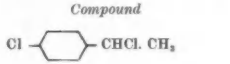
The Toxic Factor in DDT — II

by R. W. MONCREIFF

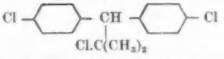
Because of the uncertainty which still exists about the source of the insecticidal activity of DDT, all the evidence being accumulated is potentially of paramount importance. This further survey of current facts and assumptions indicates some suggestive new parallels.

WOODCOCK prepared a number of chlorinated *p*-chloroethyl benzenes and tested their toxicity against the grain weevil *Calandra granaria*.[10] Most of the preparations were toxic to some degree, but none so toxic as DDT. It was found that toxicity increased with increasing chlorine content of the side-chain, although complete chlorination resulted in the product

which was virtually non-toxic and which could not lose hydrogen chloride. The relative toxicities of seven of these compounds was as follows:—

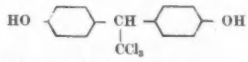
Compound	*Relative Toxiicty*	*Capable of losing* HCl
	3	Yes
	5	,,
	33	,,
	47	,,
	14	,,
	100	,,
	4	No

It is difficult to marry these values with the idea that the insecticidal activity is due to loss of hydrogen chloride. Furthermore, in the most recent communication from Skerrett, Stringer and Woodcock, it is related that the substance

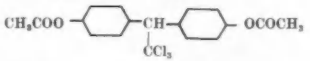


which can readily lose hydrogen chloride has little or no insecticidal activity. It seems to be evident that the view can no longer be maintained that the toxicity to insects of DDT is due to its ability to lose hydrogen chloride.

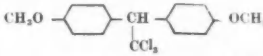
There is no doubt that an auxiliary factor in the toxicity of DDT is its lipoid solubility. Martin and Wain pointed out that the chlorphenyl groups of DDT would be expected to confer high lipoid solubility and thus high permeativity. The corresponding compounds, dihydroxydiphenyltrichlorethane



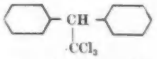
and its diacetyl derivative



are both more polar, and have correspondingly lower lipoid solubility than either DDT or dimethoxyphenyl-trichlorethane (Methoxychlor)



Furthermore, the compound diphenyltrichlorethane



is relatively non-insecticidal, presumably because it is not sufficiently lipoid-soluble. So long as the *para* substituents in the phenyl group are those that will confer lipoid solubility, then the analogue of DDT will have insecticidal activity, but if they are strongly polar, e.g., hydroxyl or acetyl, there is no activity.

The product, in order to be effective, must be able to gain admittance to the insect tissues; it must have lipoid-solubility. There are thousands of substances that are lipoid-soluble and are not insecticides; the lipoid solubility is simply a necessary auxiliary property. In exactly the same way there are a multitude of substances that are soluble in water, yet relatively few of these are sweet; but no substance that is not water-soluble can excite the sensation of sweetness because it cannot make contact with the gustatory receptors. No DDT analogue can be an insecticide unless it is soluble in the lipoids of the insect's body.

Läuger *et al* had early suggested that the insecticidal activity of DDT was due to the presence in the molecule of two *p*-chlorphenyl groups as toxophores combined with the inhalation-anaesthetic effect of the $-CCl_3$ group, which also constitutes a large part of the molecules of chloroform and of chloral hydrate. Certainly, the high chlorine content of the DDT molecule attracts immediate attention—slightly over 50 per cent (by weight) of DDT is chlorine.

The Newer View

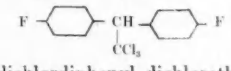
One is reminded of other insecticidal compounds that have high chlorine contents, notably Gammexane and such moth-proofing agents as pentachlorphenol (Mystox B), the Eulans, Lanoc CN and Mitin FF, all of which are very rich in chlorine. Their constitution has been discussed elsewhere.[11] The toxophoric properties of the $-CCl_3$ group might be expected to lead to nerve paralysis, and when other efforts to find the toxic factor of DDT fail, most workers come back to the likely toxicity of the $-CCl_3$ group. Most recently, Skerrett, Stringer and Woodcock, having established beyond any reasonable doubt that neither molecular shape, nor ability to lose hydrogen chloride, is the essential property for the DDT analogue to exhibit insecticidal activity, have come back to the view that the insecticidal properties of DDT are bound up in some obscure way with some intrinsic property of the $-CCl_3$ group.

It should, however, be possible to take the matter a little further than this, and it will be helpful to consider what light the adaptation of insects to DDT and its analogues can throw on the subject. It seems now to have been established that some flies (house flies) are more resistant to DDT than the majority. When DDT is used repeatedly, only the resistant flies survive, and as they breed they develop a resistant strain. Keiding and van Deurs[12] have reported that DDT has been widely used since 1944 for fly control in Denmark. In some cases resistance was noticed the year after the first DDT treatment, but, in general, resistant flies were not observed until after two or three years of successful control with DDT.

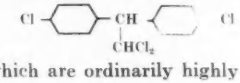
Evidently, the continuous selective extermination of non-resistant flies has resulted in the development of whole populations of the resistant type. House flies were collected in 1948 from six places from which reports had been received that they "could not be killed with DDT." even with much higher doses than usually recommended. Strains bred from these flies showed very great resistance when tested against a normal strain, as the following figures show:—

Insecticide dose	*Strain*	*Per cent flies knocked down after hours*					
		½	1	3	6	24	48
DDT 5 per cent oil solution	Normal	94	100				
2 gram DDT per sq. metre of surface sprayed	Resistant No. 1	0	0	0	0	11	11
	No. 2	0	2	37	40	58	72
	No. 3	0	0	3	6	18	36

In some cases, flies "white all over" with 33 per cent DDT dust lived for several days, so successfully had resistance been bred into them. The flies that were resistant to DDT were also found, on test, to be resistant to Methoxychlor, as well as to Gix, the fluorine analogue of DDT (described by Domenjoz[13]),



and to dichlordiphenyl dichlorethane

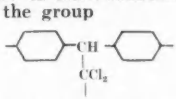


all of which are ordinarily highly toxic to flies.

They were, however, not resistant to insecticides of other types, e.g. benzene hexachloride, Chlordane, 1,2,4,5,6,7,8,8-octachloro - 4,7 - methano - 3a,4,7,7a tetrahydroindane, and Toxaphene, a chlorinated camphene. It has been found, in fact, that benzene hexachloride can be used to control DDT-resistant flies.

A Common Factor

These results throw some light on the problem of wherein lies the efficacy of DDT and its analogues. Since DDT-resistant strains are also resistant to Methoxychlor, it seems that the group common to these two must be that which is toxic. If we add the evidence obtained from the non-toxicity of dichlordiphenyl dichlorethane to DDT-resistant strains, it seems that the group



which is the highest common factor, or a part of it, must be responsible for the toxicity. The previously held view that the $-CCl_3$ group is responsible for the toxicity is difficult to uphold.

At this stage, let us return to a fresh consideration of the nature of the toxic group. If we examine, in the light of the above consideration, the findings of Skerrett, Stringer and Woodcock, we find

(*continued at foot of next page*)

DISTRIBUTION MEASUREMENTS OF DDT

Shell Organisation's Field Trials Station

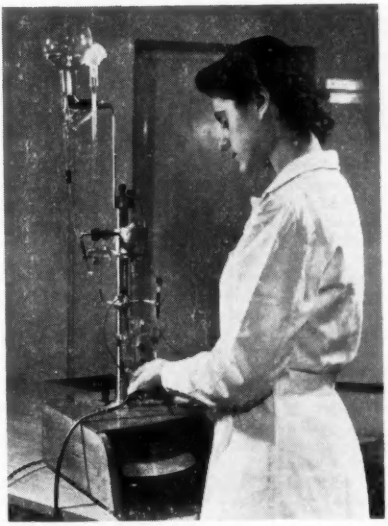
AN experimental station, with laboratories equipped for production and testing of new compounds potentially useful as insecticides and weed killers, has been developed from a formerly derelict farm.

This station, which Shell Chemicals, Ltd., has established at Woodstock Farm, Sittingbourne, Kent, was the subject of a visit by the Press on June 21.

Field testing includes fixing of the minimum amounts of spray substances required to adhere to leaf surfaces, and special apparatus has been designed to assist in this work. A satisfactory method of measuring areas of leaf surfaces had first to be devised, and measurements are now made with the Arealimeter, an instrument constructed at Woodstock.

A batch of leaves is placed on a glass table screen within a cabinet, with a powerful light that throws shadow images of the leaves on to a photo-electric cell below, so that the total area of the leaves may be read from a galvanometer scale.

If the amount of DDT deposited on leaves requires to be recorded the DDT is dissolved off with benzene, which is then removed by evaporation in a current of air. Sodium hydroxide is added to the DDT and the sodium chloride thus produced is estimated by the silver nitrate method, which gives a measure of the amount of DDT present.

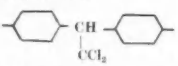


Adding silver nitrate by potentiometric titration, the amount required to neutralise the test solution bearing a direct relationship to the DDT content

THE TOXIC FACTOR IN DDT

(*continued from previous page*)

that of the six compounds that they made, only two possess the

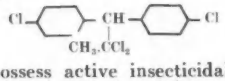


group and that these are the only two of the six which show any appreciable insecticidal activity.

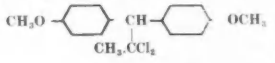
Too many compounds which do not embrace the $-CCl_3$ group in its entirety have been made and found to possess high insecticidal activity for the view to be supported that this group is essential to provide the necessary toxicity. There are, however, no compounds, analogues of DDT, of high insecticidal activity which do not contain the group $-CCl_2-$. It is to this group, its toxic action augmented by the lipoid solubility due to the *p*-chlorphenyl groups, that we must look for the toxic factor of DDT.

Substitution of other non-polar groups for the two chlorine atoms in the *p*-chlorphenyl positions will not greatly affect the lipoid solubility and will not, so far as can be seen, affect the toxicity of the substance. It is for this reason that so many analogues of DDT are toxic.

If this view is correct, then the compound



should possess active insecticidal properties; so also should its methoxy analogue



REFERENCES

[10] Woodcock, *J. Chem. Soc.*, 1949, 203-7.
[11] R. W. Moncrieff, "Mothproofing," pp. 59-84. London, 1950.
[12] J. Keiding and H. van Deurs, *Nature*, 1949, *164*, 964-5.
[13] Domenjoz, *Helv. chim. Acta.*, 1946, **29**, 1317-22.

A RAPID METHOD OF IMMERSION SILVERING

Pre-Treatment with Stannous Chloride

A NEW method of silvering has been discovered in the course of investigations undertaken by the Printing, Packaging and Allied Trades Research Association for the purpose of improving the process of electrotyping. This has been described by Mr. P. G. B. Upton (PATRA) and Dr. E. F. G. Herington (Chemical Research Laboratory, DSIR).

Members of PATRA suggested that the wax moulds used for electrotyping might be made electrically conductive by some cleaner and more efficient method than the usual application of graphite to the surface. The investigators considered that this might be achieved effectively by the application of a silver film to the surface. Experiments undertaken resulted in the development of a suitable process for this purpose. In the course of this experimental work the chemists became interested in the actual mechanism of the reduction of silver from the silvering solutions under investigation.

Most methods of producing silver mirrors by the chemical reduction of an aqueous silver solution suffer from the defect that only a small proportion of the reduced silver is deposited as a mirror on the required surface. The remainder is either deposited on the walls of the containing vessel or is precipitated in the solution and eventually forms a loose black sludge. Apart from the waste of silver involved, this sludge is objectionable, since it may spoil the mirror during its formation.

Efficient Precipitation

In general, methods of increasing efficiency (*i.e.*, the proportion of precipitated silver deposited as a mirror) depend *inter alia* on the reduction of the rate of reaction by the addition of various inhibitors.

While the mechanism of the silver process was being studied by PATRA, it was noted that a 1 per cent ammoniacal solution of silver, to which about 10-15 per cent of pyridine had been added, did not show any appreciable deposition of silver on the addition of sufficient hydrazine sulphate to reduce all the silver salt present, calculated on the reaction:

$$N_2H_4H_2SO_4 + 4AgNO_3 + 6NH_4OH = 4NH_4NO_3 + N_2 + 4Ag + (NH_4)_2SO_4 + 6H_2O.$$

It was found that, on a surface which had previously been treated with a solution of stannous chloride and washed with water, a heavy silver mirror was rapidly deposited. The following tables show the rate of deposition of silver, and the considerable thickness of the mirrors obtained from the solution with the pyridine addition, compared with values from the smoothed data of W. H. Banks for a normal type of process (using formaldehyde as the reducing agent) in which the surface was also prepared by treatment with stannous chloride.

70 ml. 1% ammonical silver nitrate. 10 ml. pyridine, 16 ml. 1.25% hydrazine sulphate.

Time sec.	Silver deposited gm/sq. dm.	Time sec.	Silver deposited gm./sq. dm.
30	0.0064	420	0.0424
60	0.0095	660	0.0598
180	0.0216	3,600	0.164
300	0.0301		

Equal volumes 6% ammoniacal silver nitrate, 1% formaldehyde.

Time sec.	Silver deposited gm/sq. dm.	Time sec.	Silver deposited gm/sq. dm.
30	0.012	420	0.033
60	0.015	660	0.043
180	0.018		
300	0.028		

Despite the high rate of deposition maintained on the surface sensitised by treatment with stannous chloride, very little silver precipitation occurred in the bulk of the solution or on the walls of the containing vessel, and the solution remained perfectly clear and still usable some 24 hours after preparation, during which time a number of silverings had been made. The effect of the stannous chloride treatment in increasing the initial rate of mirror formation has been noted by previous investigators and has been shown quantitatively. It was believed at first that the effect of the pyridine addition was simply to reduce the silver ion concentration to a point where the reduction for any practical purposes would not proceed in the absence of a catalyst.

However, experiments with other amines, which would give even lower silver ion concentration from dissociation of the general $AgBO_2H$, failed to reproduce the differential inhibiting effect of pyridine. It was therefore concluded that either an impurity was present in the pyridine used (redistilled laboratory reagent grade) or that pyridine behaved uniquely in some way not understood. Tests were made with other

(*continued on page* 17)

IMPROVING FRACTIONATION EFFICIENCY

U.S. Experience with Rotating Columns

A NEW rotary concentric-tube distillation column for which very high efficiency in fractionation is claimed is one of the interesting results of recent studies in the U.S.A. of chemical treatment of the hydrocarbon oils. The research is the joint operation by the U.S. National Bureau of Standards and the American Petroleum Institute.

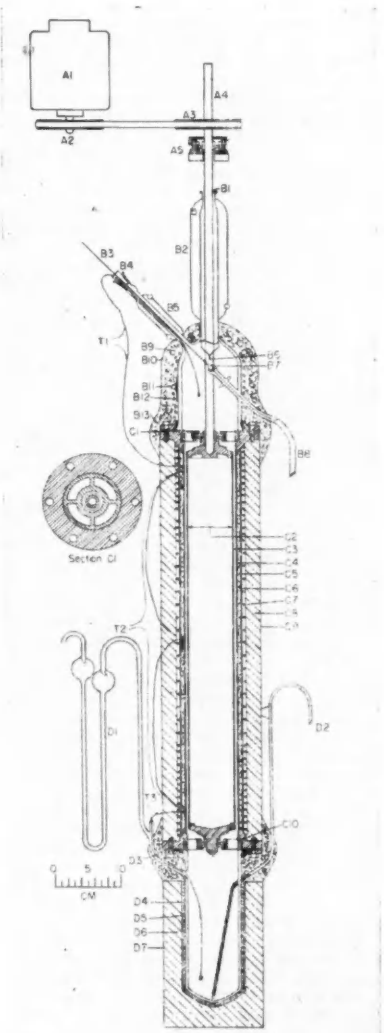
The experimental programme now being carried out at the bureau has two objectives: the investigation of the chemical constituents of the crude oil based upon the actual isolation of pure hydrocarbons and the securing of high-purity standard samples for the calibration of instruments used in analysing such complex mixtures as aviation fuels and synthetic rubber components. The new distilling column, which is expected to have wide application to fractional processes, is expected to aid materially in the bureau's hydrocarbon research.

Numerous devices, based on both theory and experiment, are available for producing high separating efficiencies in distilling columns. Among these are open tubes of small diameter, concentric tubes with a small annular space, and parallel plates with a small space between them. All, however, are limited in use by the relatively low quantity of material that may be volatilised per hour. According to theory, the efficiency may be improved by decreasing the spacing of the tubes or plates of the column, by decreasing the quantity of material for volatilisation, or by increasing the rate of diffusion of the gas molecule through the distilling column.

Improving Separating Efficiency

Decrease in the spacing (or diameter) has already been carried about as far as is practicable, while decreasing the quantity of material below the present low values is not feasible. Moreover, in a static apparatus, for a given temperature and composition, the rate of diffusion of the gaseous molecules is substantially constant. Accordingly, the new distilling column was designed to improve separating efficiency by increasing the diffusion rate of the molecules in the gas phase. This is accomplished by forcing the gas into turbulence through rotation of the inner closed cylinder in a concentric-tube rectifying section.

(continued overleaf)



The apparatus consists of three parts—Pyrex head (B), steel rectifying section (C), and Pyrex pot (D). All sections are provided with external heating elements and copper-constantan thermocouples for temperature regulation. The steel rectifying section of this distilling column is the empty annular space, 0.043 in. (1.09 mm.) wide, formed by the inside surface of a stationary outer cylinder and the outside surface of a rotating closed inner cylinder, 2.928 in (7.44 cm.) in outside diameter and 23.0 in. (58.4 cm.) in length. A motor-and-pulley system drives the rotor at speeds up to 4000 r.p.m.

The outer cylinder is enclosed in an asbestos-covered metal heating jacket surrounded by three nichrome heating elements for the top, middle, and bottom portions of the jacket, respectively. The heating elements are covered externally with magnesia insulation and a layer of aluminium foil. The Pyrex glass head consists principally of a water-jacketed condenser directly above an opening into an electrically heated chamber, in which the liquid reflux may be collected and sampled by means of a glass valve. The heated chamber is surrounded by asbestos wool insulation and aluminium foil.

The pot, made of a 3-in. Pyrex pipe, is sealed at one end and provided with a butyl carbitol manometer and a tube for withdrawing samples. Heated externally by a Glasscol special sleeve-type heater, this also is surrounded by magnesia insulation covered with aluminium foil. Three thermo-elements are provided. One measures the difference between the temperature of the top portion of the rectifying section and the liquid-vapour equilibrium in the head. Another measures the difference between the temperature of the middle portion and the mean temperature of the top and bottom portions of the rectifying section. A third is used to determine the difference between the temperature of the bottom of the rectifying section and the temperature of the liquid in the pot.

Effect of Rotation

For high values of material to be volatilised—two to four litres of liquid per hour—this distillation column, when operated at 4000 r.p.m., has an efficiency factor about ten times those previously reported for other rectifying columns. The efficiency factor changes relatively little with intake of material at a given speed of rotation, but increases markedly with speed of rotation. This column also has low values of pressure drop per unit of material to be volatilised, which may be quite advantageous for distillations at low pressure.

Radioactivity of Solid Potash Fertiliser

POTASSIUM salts show a natural radioactivity which can be used for estimation of mixtures and compounds. The methods which have been described earlier have necessitated dissolving the sample and the radioactivity has been measured by using special Geiger-Muller counters for liquids. This was stated in a paper on "The Determination of Potash (in Fertiliser) by Measurement of its Radioactivity," by D. S. Lees, W. Broomfield and H. N. Wilson, presented at a recent meeting in London, of the Physical Methods group of the Society of Public Analysts and Other Analytical Chemists.

GM Technique

In the general absence of such specialised counters in this country, it had been possible to devise a reliable method of measuring the radiation of the solid itself. A 2-in. diameter Geiger-Muller counter was employed inside a lead castle fitted with fixed racks so that the distance between counter and sample was the same for all samples. It was essential that the area of the solid should be sufficiently large and the layer thicker than the critical depth.

The Geiger-Muller counter in its lead castle with preamplifier were connected to the scaling unit which counted the pulses generated. The maximum rate of handling was 2000 pulses per minute. The whole equipment was mains operated. Calibration was made with standard mixture of Analar potassium chloride, pure ammonium sulphate and pure ammonium phosphate.

The varying background count produced by strong radiation reduced the accuracy of the method, and it had been found necessary to take 40,000 counts to obtain a standard deviation of 0.5 per cent, which was equal to that of chemical methods. It was also necessary to watch for the presence of other radioactive elements, but in their absence the method had given satisfactory results on fertiliser samples containing 14.5 to 16 per cent of potassium oxide.

(continued from page 14)

materials known to occur in pyridine, but while comparable results were obtained with alpha and beta picoline, results did not show that the phenomenon was traceable to any particular constituent.

When the process was recommended, however, as a practical means of heavily silvering plastics in the manufacture of a special electrical component, it was found that the results obtained were markedly dependent on the source and quality of the pyridine used, and that no differential inhibition of silver reduction occurred when a sample of pyridine of purity greater than 99.9 mol. per cent, as established by the freezing point, was used. Examination by the Chemical Research Laboratory of a sample of pyridine found to give satisfactory results revealed the presence of a very small amount of a surface active agent. When a sufficient amount of a surface active agent was added to pure pyridine, differential inhibition of silver reduction was obtained.

It was also established that the variable behaviour of different pyridine samples was attributable to the varying proportion of surface active agent present. The desired results could be reproduced by adding a suitable proportion of *Fixanol C* (cetyl pyridinium bromide) to "inactive" pyridine, so that the process becomes completely controllable.

Stages of Inhibition

The addition of increasing proportions of surface active agent to a sample of pyridine giving no differential inhibition produces results in the following sequence: (1) No apparent inhibition of silver precipitation: (2) inhibition of precipitation in bulk of solution, but mirror deposition on walls of vessel as well as a sensitised stannous chloride treated surface; (3) inhibition of precipitation in solution, no deposition on walls of vessel but good deposition on sensitised surface; (4) as (3), but poor deposition on sensitised surface; (5) complete inhibition, *i.e.*, no deposition of silver at all. These effects change with the age of the solution and, in general, any inhibited solution will start to deposit silver after some hours.

These observations suggest that pyridine itself has no unique property in this process. Good differential inhibitions have been obtained by adding bases instead of pyridine—notably ammonia and *cyclo*hexylamine—in suitable concentration together with the appropriate addition of cetyl pyridinium bromide, using solutions of the order of 0.001 per cent.

The following is a recipe based on the use of pyridine: The surface to be silvered is pre-treated by being wetted with a solution of 10 gm. $SnCl_2$ in 20 ml. HCl (A.R.) and 80 ml. water. The surface is then rinsed with a 5 per cent silver nitrate solution, well washed with distilled water, and kept under water until required.

Two silvering solutions are prepared. Solution 1 consists of 10 ml. of *Fixanol C* solution (0.005 per cent), 16 ml. of 1.25 per cent hydrazine sulphate solution. Solution 2 comprises 70 cc. of 1 per cent solution of ammoniacal silver nitrate prepared by adding 0.880 per cent ammonia to 1 per cent silver nitrate solution until the precipitate just redissolves.

These two solutions are mixed just before use. The amount of *Fixanol C* solution is adjusted to give satisfactory results. No exact quantity can be recommended, since the amount required depends on the concentration of surface active agent already present in each batch of pyridine, and this may change with time.

Catalytic Effects

The process has proved useful as a tool to investigate the catalytic effect of silver, platinum and various other metals on the chemical reduction of metals from aqueous solution. The authors are of the opinion that the method should be of considerable use wherever the rapid and efficient deposition of a heavy silver film is required. The modern tendency in commercial silvering, however, is to use a spraying method in which the silvering solution and reducing agent are combined in a spray gun.

The new immersion process has already proved useful in the Telecommunications Research Laboratory, where it is used to apply a thick film of silver to the inside of tubes, enabling this operation to be employed with a degree of precision in applications where the spray method would not be practicable. It is considered that the process should be useful for instrument manufacture and for laboratory requirements, and further applications will no doubt be indicated as the principle becomes well known. The investigators have succeeded in establishing that the influence of a detergent in inhibiting the deposition of silver is quite remarkable, and this should enable silvering to be undertaken with a greater degree of control.

Pyridine is, unfortunately, rather toxic, but now that the principle has been established, it should be possible to use the detergent addition established in silvering processes to improve the efficiency of deposition, using a rather higher ammonia concentration than usual instead of the pyridine addition.

Metallurgical Section

1 July 1950

PROPOSED NEW HARDNESS SCALE

Russian Work on Instruments and Method

FURTHER information has now been published on the new micro-hardness tester PMT-2 designed by Prof. M. M. Krushchov, who introduced a year or two ago a new hardness scale and formula, as an improvement on the Mohs scale (*Zavodsk, labor.*, 9, 1947). Further developments and a more extended use of the PMT-2 instrument for the study of metals and minerals have now been proposed by S. D. Dmitriev, of the Leningrad Mining Institute, in *Zapisk, Vseoiuzn. Mineralog. Obshchestv.* (Memoirs of the All-Union Mineralog. Society), 1949, Pt. 78, 4, 241-252.

Various defects of the Mohs scale are indicated once more and the Martens sclerometer is also criticised. A. K. Boldyrev[1] had claimed long ago that with that instrument he had obtained a hardness for glass of 33, that is to say, higher than those of orthoclase or quartz. This may have been due to excessive wear of the diamond, for it is not always appreciated that even this material is liable to wear when used continuously in testing hard materials in the range of 7 and over in the Mohs scale (quartz, topaz, and corundum).

The PMT-2 Tester

Russian writers assert that hitherto there has been no really suitable instrument for accurately determining the hardness of these very hard materials. Dmitriev points out that, although the PMT-2 may not entirely fulfil all requirements, it nevertheless marks a substantial advance.

It is not very fully described. Essentially it consists of a microscope and a special form of indentor fitted with a square-based diamond pyramid. The stand on which the test-piece is placed can turn approximately 180° between the stops. It is claimed that alignment of the microscope axis with the test-piece is accurate to within 2-3 *mu;* and with the improved instrument in the Leningrad Mining Institute (PMT-2 No. 0-38) accuracy is within 0.5 *mu*. Microhardness is determined by the formula:

$$H = 2 \sin \frac{\alpha}{2} \frac{P}{d^2}$$

where α is angle between opposite facets of the diamond pyramid, namely 136°, P is the load in kg., d is the diagonal of impression in mm. Hardness number represents kg/mm².

Although a fairly considerable literature has grown up on the subject of both micro- and macro-hardness testing, relatively little relates to mineralogical study.[2] The first article of Prof. Krushchov was published in 1947[3] and was concerned with the choice of a basic method for determinining hardness of materials, and introducing a new scale for comparison with Mohs.

TABLE 1
New hardness numbers in kg/mm²

Mineral	Mohs scale	M.M. Krushchov	S.D. Dmitriev
Talc	1	2.4	10–11
Gypsum ...	2	36	39–90
Calcite ...	3	109	145–165
Fluorite ...	4	189	175–260
Apatite ...	5	536	550–690
Orthoclase ...	6	795	780–850
Quartz ...	7	1,120	1,200–1,460
Topaz ...	8	1,427	1,800–2,000
Corundum ...	9	2,060	2,050–2,200
Diamond ...	10	10,060	—

Table 1 shows the Mohs scale compared with the independent numbers obtained by Krushchov and Dmitriev. It has to be noted that the Mohs' numbers are obtained with the natural facets of crystals and planes of cleavage without polishing, and that Krushchov gave definite values (averages) without the maximum and minimum limits given by Dmitriev. Such extremes are due to (1) varying hardness of the same minerals; (2) varying error

range of two instruments; and (3) subjective errors in measurement (not yet a single standard method). It is suggested that standard authoritative methods with standard materials should be introduced.

In 1948 appeared the work of N. Iu. Ikornikov[4] on the micro-hardness of a real crystal, with brucite as the example, in which it was shown that lack of homogeneity in hardness was an outstanding characteristic of crystals and was related to structural peculiarities. This had, in fact, been realised long before 1948. Another Russian writer published in the same year the results of his study of the hardness and strength of quartz of zonal and sectoral structure by the indentation method.[5]

Krushchov's Scale

A more important work was that of M. M. Krushchov on a new hardness scale published in 1949.[6] He showed that the first nine members of Mohs scale are arranged in a series ascending in proportion to the cubes of the scale numbers, and proposed that a further five classes be added, to make 15 in all. Hardness number (class) $H_o = 0.7H^3$, where H is hardness number in kg/mm^2 and H_o is Mohs scale number.

In 1948 the Crystallography Department of Leningrad Mining Institute began a programme of research on the micro-hardness of crystals with a view to adapting the new method to the study of minerals. It was based to some extent on Talmage's classification[7] in seven groups, A to G, and it was decided to verify whether this scale could be used in connection with diamond pyramid indentor micro-hardness tests. Other objectives were to determine hardness variation limits in the same mineral, the extent to which overlapping in hardness values of a group could be eliminated; and whether micro-hardness determinations could be made with mineral grains or crystals as small as 0.02 mm. in diameter.

The magnification used was ×600, drop period of indentor 15 sec., and exposure 5 sec. Efforts were made to determine extreme limits of hardness in the same mineral by using samples from widely different sources and by several tests on same sample in different zones, both natural and polished facets. Loads ranged from 5 to 200 g., and results recorded were averages of 5 to 10 micro-hardness tests. So far as possible, specimens were free from any defects. Using the Talmage series of minerals the following results were obtained (A). Table B presents a series in which overlapping has been eliminated:—

No.	A Name of mineral	A Hardness in kg/mm^2	B Name of mineral	B Hardness in kg/mm^2
1	Argentite	10–30	Argentite, bismuth	10–30
2	Galenite	70–105	Native Cu, galenite	65–115
3	Chalcopyrite	180–250	Bismuthine	120–165
4	Tetrahedrite	180–275	Chalcopyrite, sphalerite	170–250
5	Nickelin	390–520	Pyrrhotin	265–375
6	Magnetite	480–740	Ilmenite, magnetite	480–740
7	Ilmenite	505–690	Arsenopyrite	810–1,250

As a general rule in testing metal micro-hardness, the minimum size of grain or crystal should be such that the edges of impression made by indentor should be at least distant from the edges of test-piece by twice the diagonal length of the impression; and thickness of the test-piece should be more than ten times the depth of the impression made by the diamond pyramid of 136° angle, the ratio of depth/diagonal being 1:7.

With the new instrument PMT-2 other properties of minerals besides micro-hardness were also investigated, such as plasticity and tensile strength. Considerable attention was given to the forms of impression and these are illustrated and discussed, together with numerous pressure diagrams for ilmenite, bismuth, calcite, etc.

REFERENCES

[1] Boldyrev, A. K., *Crystallography*, 1934.
[2] Khrushchov, M. M. and E. S. Berkovich. Micro-hardness, Determination by Indentation, Izd. AN (*Trans. Acad. Sci.*) SSSR, 1943.
[3] Khrushchov, M. M. Choice of Basic Method for Determining Hardness of Materials. *Zavodsk. labor.* 1947, 9.
[4] Ikornikov, N. Iu. Microhardness of a Real Crystal as Exemplified by Brucite, DAN (*Comptes Rendus Acad. Sci.*) SSSR, 1948, *59* (7).
[5] Tsinzerling, E. V. Study of Hardness and Plasticity of Quartz, Zonal and Sectoral, by Indentation Method. DAN (*Comptes Rendus Acad. Sci.*) SSSR, 1948, *60* (6).
[6] Khrushchov, M. M. Introducing a New Hardness Scale. *Zavodsk. labor.* (Works. Lab.), 1949, No. 2.
[7] Talmage, S. B., Quantitative Standards for Hardness of Minerals, *Econ. Geol*, 1925, **20**.

Indian Aluminium Cables

An aluminium cable factory has been inaugurated at Kundara, near Quilon, India. This is turning out on an average about 10 to 11 miles of cable per day and the product is said to compare favourably with the imported product. There is a great demand for aluminium cables in India and it is the intention of the factory—the only one of its kind in India—to double its production capacity in the near future.

SOURCES OF BRITAIN'S PLATINUM

Rich Yields from South Africa's Deposits

THE South African output of platinum metals increased last year to 84,300 oz. compared with 68,926 oz. in 1948. By an expansion programme now approaching completion, output is expected to be raised very soon to an appreciably higher level. This aspect of the "productivity" theme is of considerable importance to British chemical, instrument and other industries because the entire output is exported to the United Kingdom.

The Union's known resources of platinum are immense. The Merensky Reef, discovered in 1924, has been located at intervals over a distance of about 100 miles in several districts of the Transvaal. This reef is a pseudo-stratified band of gabbroidal rock containing platinum sulphides. The band varies in width from a few feet to over 30 ft., the main platinum metals in the ores being platinum and palladium, though ruthenium, iridium and osmium are also found. Values vary from about 2 to 7 dwt., selected areas in the Rustenburg district assaying between 5 and 7 dwt. per ton over stretches measuring from 5000 to 18,000 ft. along the strike and several hundred feet on the dip.

Mining operations were started nearly 25 years ago under very favourable conditions, but the recovery of platinum metals from Canadian copper-nickel ores brought about a drastic change in the supply position. The price of platinum slumped, and, due to technical difficulties in the treatment of the ores with consequent high production prices, most South African producers were obliged to close down.

The Reduction Treatment

Since 1932 the Union's sole producer has been Rustenburg Platinum Mines, Ltd. This company has extracted the oxidised ore from its mine over a long stretch of strike and now draws its ore supplies from the sulphidic zone. The reduction treatment comprises gravity concentration followed by flotation. The flotation concentrates are smelted on the property in a blast furnace, a matte containing copper and nickel being produced. This matte is enriched by converting and shipped to London for refining and sale. With it come crude platenoids obtained by gravity conversion.

In view of the improved outlook resulting from the rapid increase in world demand, Rustenburg Platinum Mines decided after the war to double its plant, which was then capable of treating 20,000 tons of ore per month. Last year the rate of milling was progressively increased as portions of the new plant became available for use. By the end of the year it was in the vicinity of 50,000 tons a month. This rate could not be exceeded until the full supply of power was made available by the Electricity Supply Commission, which was expected to take place early this year.

Profitable Development

Last year the production of platinum was started in the same district by the Union Platinum Mining Co., Ltd. This company's ore reserves have been estimated at 4.8 million tons of ore, capable of permitting 32 years milling at the rate of 150,000 tons per annum. The available reserves are estimated at 250,000 tons of oxide ores and 89,000 tons of sulphide ores, averaging 6.3 dwt. of platinum metals per ton. So far development has shown 100 per cent payability.

Early last year, a plant capable of treating 150 tons daily was put into operation and plant to treat 500 tons daily is under erection. In September the operations of this company were reorganised with a view to treating sulphide ores only. Various changes were made in the reduction plant and it is expected that within the next few months production will reach the maximum permitted by the available power supply, approximately 10,000 tons per month. Augmented electrical power is expected to be available next year.

By an agreement ratified in December, Rustenburg Platinum Mines, Ltd., acquired the whole of the assets of the Union Platinum Mining Co., Ltd., and assumed its liabilities as from August 31, 1939.

The dismantling and rebuilding of the smelting furnace of Rustenburg Platinum Mines, Ltd., will be carried out shortly, and it is anticipated that there will then be sufficient capacity to smelt the concentrates from both the Rustenburg Platinum and Union Platinum sections.

Arrangements have been made with Johnson, Matthey & Co. to treat the combined output from both mines. The London company is extending its plant to deal with matte, and treatment of the South

(*continued at foot of following page*)

Mercury Production in Slovakia

An Important By-Product

From a SPECIAL CORRESPONDENT

THERE are three centres in Slovakia where mercury is produced. These are situated in the districts of Koterbachy, Mernik and Gelnica. Although the production of these centres amounts to only 2·3 per cent of world production, it is of importance as a by-product especially as the ore is amenable to direct distillation with the addition of lime to the retort to minimise corrosive action.

The extraction at Koterbachy goes back to 1837, when it was discovered that the silver-containing copper ores, the so-called "fahlerze," had a remarkable content of mercury. When, in 1895, the copper ores were exhausted, the mining and refining of iron ores which also contained mercury was established. Without either flotation or combined tabling and flotation, the ores are simply disintegrated and treated by direct furnacing, after being roasted in jacketed furnaces containing 1300 cwt. of material. The roasted gases pass to washing towers by means of ventilators, whereby mercury is condensed in the stubb (or stupp).

A more highly productive cinnabar deposit existed in Mernik, near Vranov, in Eastern Slovakia, where the ores were roasted in two large rotary furnaces connected to a well-constructed condensation plant. In 1942, however, when the Mernik ores were exhausted, the plant was removed to Gelnica. The ores of this district contain an average of 0.25 per cent mercury, or 5 lb. per ton of ore, compared with 14 lb. mercury ores being treated in Italy and 120 lb. ores in Spain.

The ores are brought from the sifting grate of a crushing and grinding plant over a rolling mill to the charging bunker of the rotary furnace which is 14 m. in length. The roast gases of this rotary kiln, heated with gas, are brought by ventilators into a concrete chamber (4.4 by 2.8 by 5 m.) before entering the condensation plant consisting of four cast iron tubes connected to eight up-and-down pipes cooled with water. Also connected are two concrete towers of 1 m. diameter into which water is sprayed. After lime addition, a press deals with the rich stubb thus collected, which is afterwards distilled in two iron retorts of 1.75 by 1.10 by 0.45 m. In 24 hours 300 kg. stubb can be worked up, the mercury vapour being treated in a condensation plant.

The mercury production of Slovakia owes its development to a large extent to Dipl.-Eng. Walter Wendt, who is also responsible for her important antimony industry. (THE CHEMICAL AGE, *62*, 756.)

SOURCES OF BRITAIN'S PLATINUM

(*continued from previous page*)

African matte will be started as soon as possible.

The Merensky Reef has been the source of most of the South African output of platinum metals, but there is also an appreciable production of osmiridium, which occurs in minute quantities in the Witwatersrand conglomerates. This mineral is retained on the corduroy tables together with the gold. It is separated from the gold in amalgamation barrels and afterwards recovered by further concentration over shaking tables.

The composition of the osmiridium is variable, the content ranging from 26 to 43 per cent, closely followed by iridium and small quantities of platinum, ruthenium, rhodium and gold.

South Africa has long been the world's largest producer of osmiridium, an output of between 5000 and 7000 oz. per annum having been consistently maintained. Last year's production was approximately 6000 oz.

Government Steelworks to Close

TWO Government-owned steel factories are to be closed at the end of the year. They are the factory at Monk Bridge, near Leeds, and the works at Paisley, Lanark, both acquired to meet the needs of the Ministry of Supply during the war.

The official account states that, in view of the nature of the plants and type of production on which they were engaged, it was recognised that operation would be uneconomic. Losses incurred have been borne by public funds.

Both works have been kept in production until now under the management of firms which have acted as agents for the Ministry, but the expansion of steel output in the commercial factories is stated to have rendered their continued operation unnecessary.

THE ADVANCE OF TITANIUM

Increasing Use in Modern Metallurgical Processes

By A. E. WILLIAMS, Ph.D., F.C.S.

TITANIUM has long been used in industry in the form of titanium dioxide, a white pigment which has the advantage of being a most economical medium for paints, etc., because of its good covering power. In the field of metallurgy, titanium alloys have been increasingly applied during the past decade and are now firmly established as important agents for various purposes. In the steel industry, titanium is employed as a de-oxidiser, and is superior in this capacity to such metals as manganese, aluminium and silicon. Nitrogen gas is also eliminated by the use of titanium in steel, where the older deoxidising metals have no effect.

U.S. Titanium in 1949

The U.S. Bureau of Mines reports that widespread research in connection with the production of titanium metal and alloys was undertaken by the Government and private industry in 1949. *The outstanding problem is to produce the metal at sufficiently low cost. In* 1949, *titanium metal was produced commercially for the second successive year. One pilot plant produced about* 100 *lb. per day, and another, of rather larger capacity, was put into operation near the close of the year.*

Titanium has the property of modifying the grain size of steel, so that the properties of the latter are enhanced. When a ferro-titanium alloy is used in iron and steel a metal of maximum density is obtained, since internal cavities have been removed, and the resulting metal shows improved mechanical properties. The reason why titanium is superior to aluminium as a deoxidiser of ferrous metals is that titanium oxide, which is formed within the molten iron or steel, melts at a temperature of 1560° C., so that it rises to the surface with the molten slag, from which it can be removed.

On the other hand, aluminium oxide, Al_2O_3, has a melting point of about 2050° C., and remains in the iron or steel, the temperature of the latter not being sufficient to melt it. Much of the aluminium oxide therefore remains in the ferrous metals. In addition to removing oxygen and nitrogen, titanium has a high affinity for sulphur and combines with it, thus reducing the intergranular brittleness.

In a similar manner, titanium is capable of controlling the formation of carbide in steel, particularly the stainless varieties. Because of the well-known action of nickel in lowering the critical points of iron, and the sluggishness with which carbides form in high chromium steels, the 18-8 steels of this type apparently have a fully austenite structure at normal temperatures. When such metal is heated for a short time, however, some particles of carbide form in this austenite, and these carbides, which consist of 75 to 90 per cent chromium, rob the matrix in their immediate surroundings of so large a proportion of this element that the residue is unable to protect the metal from corrosion by certain chemial reagents.

Chromium Retained

This can be corrected by the use of titanium. If about six times as much titanium is present as there is carbon, the carbide formed from the metastable austenite is chiefly titanium carbide, instead of chromium carbide. In such conditions titanium forms a carbide more readily than either chromium or iron. The result is that the chromium content of the steel remains in solid solution with the iron and so can play its part in the resistant properties of the steel.

In the 5 per cent chromium steels the chromium content is not sufficient to make the steel a stainless variety, but it has good resistance to mild corrodants and to high temperatures. Such steel is used largely in the chemical process industries where high temperatures are involved. When forged and annealed, the microstructure of these steels is ferrite, with spherodised carbides, but the steel is intensely air-hardening, while castings are brittle and difficult to soften. Titanium now plays an important part in correcting these defects, for its carbides are so easily formed that the 5 per cent chromium steel, which is low in carbon and carries about ten times as much titanium, is soft and pearlitic in structure after cooling, while the chromium content forms very little carbide but remains free to fulfil its normal function.

Titanium is firmly established as a grain-refining agent in aluminium alloys, and nearly all such alloys used in aircraft and similar highly-stressed constructions contain a titanium addition. "Master" alloys are added, which contain varying proportions of titanium with other metals. The grain refining effect of titanium on aluminium alloys is regarded as being due to the dispersion of the compound $TiAl_3$ throughout the metal, causing a large number of centres of crystallisation, and acting partially as a catalyst. Titanium apparently acts chiefly on the macro structure of the aluminium alloys, rather than on the micro structure.

Shorter Heat Treatment

This type of grain refinement reduces the time necessary for heat treatment of alloys in the form of castings, forgings, sheet, etc. This is due to the greatly diminished crystal size, which permits rapid hardening results through micro-dispersion of grain boundary constituents. An aluminium alloy containing sufficient titanium to effect adequate grain refining can be worked with less edge cracking and other failures. Mechanical properties of the alloys are all enhanced.

A typical "master" alloy used for aluminium alloys contains from 1.5 to 3.5 per cent titanium, 7 to 47 per cent copper, with traces of iron, silicon, nickel and manganese, the balance being aluminium. "Master" alloys with much higher titanium contents are also used; a typical copper-free alloy being titanium 50 to 60 per cent, aluminum 35 to 40 per cent, with small amounts of iron and silicon. Other types of "master" alloy consist of titanium and copper as the main elements, while others are of the titanium-nickel type. The latter may contain from 26 to 65 per cent titanium, from 12 to 62 per cent nickel, and from 5 to 12 per cent aluminium, with small proportions of silicon and iron. For the addition of titanium to nickel and nickel-chromium alloys, these "master" alloys are practically essential; they are carbon-free and very low in other impurities.

Another application of metallic titanium is in the form of a "getter" for various types of vacuum apparatus. This is based on the affinity which titanium has for oxygen and affords an easy means of eliminating residual oxygen from vacuum vessels. A fine titanium powder is used for this purpose, immersed in a suitable volatile medium. For example, in an ordinary electric incandescent lamp, not gas-filled, residual oxygen (which the pumps cannot remove) is eliminated by painting the glass stem of the lamp with a mixture of ethyl alcohol and titanium powder. In heating and evacuating the lamps the ethyl alcohol is evaporated, leaving a thin film of metallic powder on the glass stem. This powder slowly oxidises during the life of the lamp and the residual oxygen is taken up, so prolonging the life of the tungsten filament.

Production

The most frequently used method of production of titanium metal appears to be the reduction of titanium tetrachloride with magnesium at a temperature between 800° and 900° C., in the presence of an inert gas such as argon or helium. The resulting product is titanium in powdered form and can be further purified, when necessary, by re-melting. Ductile titanium may be produced by induction melting in graphite.

The raw material for metal production, titanium tetrachloride, may be obtained by acting on the mineral rutile with coal and chlorine. The reaction vessel is charged with a layer of fused alkali chlorides, and liquid sodium is run on to the top of this layer. Titanium tetrachloride vapour is introduced into the flux layer and when the reaction is complete the vessel is cooled and the powder extracted. Iron is removed by immersing the powder in hydrochloric acid, followed by water-washing. The powder is then dried, crushed and screened.

Precipitation Route

Titanium is precipitated quantitatively from chloride solutions by tannin when the acidity does not exceed 0.02N. In this weak acid solution titanium can be separated from such metals as V, Al and Fe, but not from Zr or Th, which latter are also quantitatively precipitated. This technique is often made use of in analytical work. Because of the difficulties in producing titanium in large quantities it is not as yet extensively used in its elemental state, but chiefly in the form of alloys. The pure metal is highly resistant to corrosion and has the strength of some types of steel, while it is much lighter in weight.

Titanium is produced from ilmenite and rutile. Ilmenite is an oxide of titanium and iron, while rutile is an impure form of titanium dioxide. Both are widely dispersed in many parts of the world in igneous rocks and black sands. During the past 30 years the production of ilmenite alone has increased from 5000 tons to over 600,000 tons per annum. Extensive deposits of sands rich in titanium exist in Australia, South Africa and Japan, and

many of them can be handled by electromagnetic separation methods.

The purification of ductile titanium may be carried out by heating the metal under a high vacuum at a temperature of 1000°C., which eliminates some of the occluded gases. Titanium powder may be compacted at a pressure of 50 tons per sq. in. and sintered in a high vacuum at a temperature approaching 1000° C. The compacted metal is ductile and can be made into sheet or bar by the normal techniques. Such material when annealed has a tensile strength of 82,000 lb. per sq. in., with 28 per cent elongation, and a hardness of 55, Rockwell A scale. After 50 per cent reduction, the titanium has a tensile strength of 126,000 lb. per sq. in., a 4 per cent elongation, and a Rockwell A 65.

The investigation of the capacity of ductile titanium for fabrication has shown the best technique to be the reduction of the sintered product by cold forging, and a decrease of 50 per cent in thickness may be made in this way, but the danger of overworking the metal is avoided by adopting a 25 per cent reduction. If the forged metal is annealed under vacuum at a temperature of 1000° C. for six hours, it may be reduced by cold rolling at a rate of 0.004 in. per pass. Much larger reductions per pass may be obtained by hot rolling at a temperature of 500° C., which is below the recrystallisation temperature of titanium, and at which no oxidation difficulties occur.

Fatal Laboratory Explosion

THE directors of Monsanto Chemicals, Ltd., announce with deep regret that Mr. Richard Biggs, foreman, and Mr. William Ward, process operator, lost their lives in an explosion at the company's Ruabon laboratories on June 26. The accident occurred in a pilot plant building used for small-scale operations.

Dr. E. M. Francis and Mr. A. Meadowcroft of the development division staff and Mr. C. Heyward, a fitter, were injured and are detained in hospital. Three other employees were allowed to return home. Fire, following the explosion, was quickly brought under control by the factory and local fire brigades and damage was confined to the one building concerned.

Ardeer Explosion Inquiry

A public inquiry at the Kilmarnock Sheriff Court on June 22 failed to disclose the cause of an explosion in the detonator department at the I.C.I. Ardeer factory, Stevenston, Ayrshire, on April 28, which resulted in the death of one man, and serious injury to another.

DUTCH CHEMICAL INDUSTRY

Capital and Technical Resources

THE average investment per worker in the Dutch chemical industry is sometimes as much as 100,000 guilders. Production in 1949 was valued at 1000 million guilders, 30 per cent of which was exported, stated Dr. P. Schoenmaker, director of the Central Institute for Development in Industry, at a recent meeting in Arnhem.

The outlook for Holland's chemical industry was not unfavourable. The country possessed some raw materials of great importance, such as salt, coal by-products and oil by-products, and its geographical position facilitated low-cost imports of other raw materials. The industry was still at the first stage of its development.

More Workers Needed

Dr. Schoenmaker pointed out that at least 75,000 more workers are needed in the Dutch steel industry and about 14,000 technical experts with an academic background are required by metal goods industries. The shortage of skilled personnel has not, however, prevented metal goods makers from achieving almost complete recovery from war damage. Their total production capacity is worth 2500 million guilders a year, while exports in 1949 reached 430 million guilders.

India Modifies Aluminium Duty

The Government of India has recently modified the duty on aluminium manufactures, including plate, sheet and strip aluminium and foil used in tea chest manufacture. The duty has been changed from 30 per cent *ad valorem* plus Rs.121 per ton to 30 per cent *ad valorem* and Rs.46 per ton. Duty on crude aluminium will henceforth carry a duty of Rs.237 instead of Rs.328, the *ad valorem* duty of 30 per cent remaining unaltered.

The Chemist's Bookshelf

A MANUAL OF ORGANIC CHEMISTRY FOR ADVANCED STUDENTS. Volume One. G. Malcolm Dyson. 1950, London & New York. Longmans, Green & Co. Pp. 984. 63s.

This is the first of Dr. Dyson's three volumes to be published on the subject, and is an attempt to provide a comprehensive account of organic chemistry which will serve as a bridge between the usual text-books and the specialist monographs. Nominally, this volume is devoted only to the compounds of carbon, hydrogen, and the halogens, but there is more here than the title suggests.

In an extensive introduction the author deals with the various subject literature, including ten pages in German which help to explain the systems of reference and the collation of information. There follows the author's own special topic, a chapter on nomenclature that is at once lucid and lavish with examples.

The remainder of the book is based on a classification of compounds according to types. First come the hydrocarbons, and the fact that these merit 160 pages is an indication of the scope of the treatment; there follow chapters on alcohols, phenols and ethers as a group; aldehydes and ketones; ketenes and polyketides; acids and esters; terpenes and related compounds; polyalcohols, carbohydrates and derivatives; and steroids and biochemical substances. To each chapter there is an appendix which serves either to expand the chapter into greater detail where this is deemed necessary because of the importance of the subject concerned, or to indicate by summary interesting borderline topics which could not be fully dealt with in the text. All the many topics discussed by Dr. Dyson are interesting. They include epoxides, silicones, vitamins, hormones, plant and fish pigments, photosynthesis and a profusion of others equally vital to all concerned with the applications of the study of organic materials.

A close inspection will at once show that this is a truly impressive work. While not attempting to serve any particular syllabus, the author seems to have included everything immediately relevant and has dealt with his matter so that, with its two companion volumes to come, this work should be most useful to research graduates as a general handbook, while for less advanced students it may well provide a complete reference of the subject to beyond degree standard.

P.M.

TUBE WORKS GAUGES AND GAUGING PRACTICE. Compiled by F. W. Clark. 1950, London. Stewarts and Lloyds, Ltd. Pp. 64. 5s.

This slim volume has been prepared for use in conjunction with practical work, by trainees at Stewarts and Lloyds, but should prove useful to engineering students in general. The subject is treated on an elementary plane, but thoroughly, though no mathematics are introduced.

The author explains the objects of gauging and the meaning of "tolerance" and "limit," and describes the fundamental measuring instruments. He then deals with the methods used for gauging and measuring plain tubes under various headings, and the more difficult subjects of eccentricity and ovality. Detailed information on the gauging of pipe screws and corresponding sockets is given, and there are notes on screw threads, American pipe threads, the optical projection machine and the care and handling of gauges. Two appendices give definitions of terms relating to screw threads and details of tolerance and limits. A list of reference books is included, and there are tables of British and American standards. The whole work is well indexed. Generally, the lay-out of the book seems good, with neat and fully explanatory drawings and four photographs which help to enhance the presentation.

P.M.

Engineers' Handbook

PROGRESS of engineering is reviewed and tribute is paid to the research associations which serve the industry in the 21st edition of the British Engineers' Association classified handbook of members and their manufactures (1950) just published. The volume has been distributed to 115 overseas countries including a special dispatch to Canada and the U.S.A.

OVERSEAS CHEMISTRY AND INDUSTRY

RECORD PRODUCTION IN CANADA

Nearly $595 m. for All Chemicals in 1949

PRODUCTION in the chemical and allied industries of Canada achieved a new peacetime record during 1949. Preliminary figures indicated that the output had a value of $594.8 million, which represents an increase of 2.6 per cent over the previous peak of $579.8 million in 1948. The total value of output in 1937 was $149 million. Except for soaps, cosmetics, adhesives and vegetable oils, both production and domestic consumption were greater than in any other year, states an article in *Foreign Trade*, the weekly organ of the Foreign Trade Service, and Canadian Department of Trade and Commerce.

Exports Decline

Exports were 11.4 per cent lower than in 1948, having declined for the third successive year to $70.7 million compared with $79.8 million in 1948 and with $83.8 million in 1947. They were valued at $16,372,000 in 1935, the last pre-war year for which the export figures are available. Fertilisers, exports of which were valued at $39.4 million, accounted for 56 per cent of the total. Synthetic resins, valued at $4.9 million, sodium compounds at $4.2 million, medicinals, including penicillin and streptomycin, at $3.8 million, acids at $2.7 million, calcium compounds, at $1.9 million and pigments and colours at $1.2 million, were next in order of importance.

Imports of chemicals and allied products, on the other hand, increased by 10 per cent last year to a value of $130.6 million, the gains being mainly in drugs and pharmaceuticals, cellulose plastics, fertilisers and miscellaneous chemicals. Purchases from the U.S.A. valued at $115 million, represented 88 per cent of the total, while imports from the U.K., valued at $8.4 million, were 6.5 per cent of the total. Other countries from which chemical products were obtained were: France, $1.8 million; Switzerland, $1.1 million and Germany, $1 million. Ten years ago the value of imports into Canada from all countries was only $51.8 million, and in 1930 the figure was $36.8 million.

Ten of the fourteen industries in the chemical group showed substantial gains in output last year, compared with 1948. The percentage increases were these: Coal tar distillation, 17.7; polishes, 15.1; primary plastics, 14.4; medicinals, 11.1; miscellaneous, 8.1; compressed gases, 4.7; fertilisers, 5.9; inks, 5.9; heavy chemicals, 2.6; and paints, 1.7. The production of soaps declined 4.9 per cent; adhesives, 20.1 per cent; vegetable oils, 12.4 per cent; and toilet preparations, 1.6 per cent. It is estimated that as much as one-half of the total gain in production value of Canada's chemical and allied products in the last decade was due to increases in commodity prices.

Employment in the chemical industries has increased from 27,682 in 1940 to 40,506 in 1949, while payments in salaries and wages have advanced from $38.6 million to $95.8 million. Firms manufacturing medicinals employed the largest number of personnel, the total in 1949 amounting to 8099. Others include: heavy chemicals, 6036; paints, 5501; and soaps, 3659 workers.

British Pipes for Canadian Oil

THE Anglo-American Oil Co., Ltd., in London, acting for Imperial Oil, Ltd., has placed orders for British steel pipes valued at more than £400,000. These, for some 80 miles of 10¾-in. steel pipe, 55,000 feet of 8⅝-in. seamless pipe and 300,000 feet of 7-in. casing, have been placed with Stewarts & Lloyds, Ltd., of Glasgow. The first consignments of pipe-line have already reached Montreal and further cargoes will arrive at intervals of two weeks, until approximately 5940 gross tons have been shipped.

The pipe will be used to link the prairie city of Winnipeg, Manitoba, with the main oil pipe line, now being built by the Inter-Provincial Pipe Line Company between the great new oil fields of Alberta and the Great Lakes. The scope of this oil project is indicated by the fact that the cost of the pipe line will be in the region of £1 million, and the initial throughput to Winnipeg will approach 500,000 gal. of oil.

Indian Red Ochre

An important deposit of red ochre is reported by the Geological Survey of India to have been located near Rajpur in Saurashtra State.

SOUTH AFRICA'S CHEMICALS

A Wide Range of Production Developments

From Our CAPE TOWN CORRESPONDENT

AN agreement to produce locally metallic naphthenate driers for the paint industry and other items has been entered into by Poly-Resin, Ltd., East London, and Nuodex Products Co., Inc., of America. The South African company has been in operation about two years, operating on a 16-acre site. It began with the production of hard resins such as ester gums and resinates, modified phenolics, cresylics and maleics. Production of condensation resins of the urea, phenol and cresol-formaldehyde types followed. Later additions were a Dowtherm controlled stainless steel reactor for the manufacture of alkyd resins, and a high-speed emulsifying unit. Now plant is being added to produce special formulations involving the polymerisation of oils to meet the needs of the paint trade and printing ink manufacturers. There will be additional reactors for resin production. The South African company is now affiliated with the Reichhold Chemicals organisation in the U.S.A.

* * *

PREPARATIONS for treating metal surfaces with a phosphate coating as a paint base for increased rust protection are now made under licence from the American patentees by a new Johannesburg firm in its Port Elizabeth factory. A full range of bottle washing alkalis and detergents, as well as general industrial cleaners, is also being produced by this company at its Durban factory under licence of a U.K. company. Other products made under licence include chemical preparations for metal-colouring processes and for the laundry and dry-cleaning industries, emulsion type degreasers, hand cleaners in powder form and boiler-feed water treatments.

* * *

ALTHOUGH the area under wattle in Natal and the Eastern Transvaal now probably exceeds 500,000 acres, the industry is faced with a demand far beyond its immediate capacity to supply, said the Director of the Wattle Research Institute in his report for 1949. There is a world shortage of vegetable tanning materials and lately attention has turned increasingly to wattle as one source that could be expanded rapidly.

A SCHEME to form a local company and open a factory in the Johannesburg area to make a wide range of abrasive products for the local market has been agreed by the Norton Company, of Worcester, Mass, U.S.A., in association with Anglo-American Corporation and other South African interests. The factory is to be built on a six-acre site at Isando industrial township near Kempton Park and may be in production early next year. Most of the plant is to be imported from the parent company in America. Technicians from America will also train the 100 to 150 South African employees.

* * *

A NEW type of belt dressing, claimed to be better than similar imported products, is being made by The Savo Manufacturing Co. (Pty.), Ltd., Johannesburg. This dressing is being sold as likely to save strain on bearings, as not liable to "build-up" on pulleys, and to minimise stoppages. The company is also making a new liquid, for the removal of rust from ferrous surfaces and to delay its formation, known in South Africa as Rustex. Articles can be brush treated or dipped, with or without heat.

* * *

AN increase of 50 per cent in the production of bi-chromates and chrome derivatives, all for export, is planned at the Merebank factory of Marble Lime and Associated Industries, Ltd. The enlarged plant should be in operation by the end of this year. A further 50 per cent increase in the output is expected at a later period. The initial extensions may cost about £100,000 and the complete programme some £200,000. Additional plant to be installed will include a rotary kiln and auxiliary plant for grinding, separating, mixing, residue handling and leaching. The chrome salts, such as sodium bichromate, chrome tanning salts, chromic acid, etc., will be exported to neighbouring African territories, to Europe, the Mediterranean countries, the Far East and South America, where it is believed good markets can be developed. Research by the company has resulted in the production of sodium sulphide for use as a depilatory by the tanning industry.

Technical Publications

SOLVENTS resulting from the Catarole cracking process which are suitable for oils, fats and waxes and most types of synthetic resins are described in a leaflet, No. 3A, issued by Petrochemicals, Ltd. Catarex solvents 15-9 are close boiling and water white. They do not tend to leave a "tail" on evaporation under normal conditions. They are stated to have a characteristic pleasant odour, to be free from corrosive sulphur compounds and contain less than 0.05 per cent total sulphur. Flash point of over 100°F. puts them in the relatively safe class of hydrocarbon solvents.

* * *

THE excellent mechanical properties of nickel-aluminium bronze alloys and their resistance to corrosion and erosion have led to their increasing application in industry and engineering. A new publication dealing with the composition and properties, machining, welding, brazing, soldering and founding of these alloys is now available from the Mond Nickel Co., Ltd.

* * *

A PORTABLE unit which will convert ordinary tap water to deionised water at the rate of about five gallons an hour has now been devised by the Crystal Research Laboratories, Inc., Hartford, Connecticut. Known as the Deeminizer, the unit is described in an article in the "Rohm and Haas Reporter" (Vol. 8, No. 1).

* * *

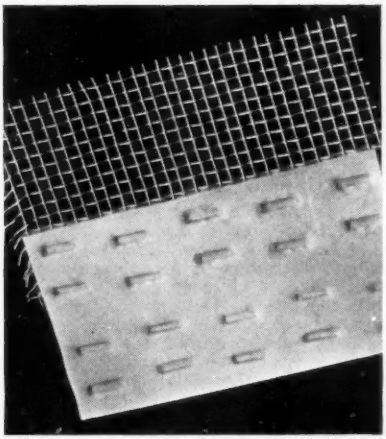
THE historical and statistical background of plastics, their raw materials, applications, and the research and development of an expanding industry were the subject of a special supplement published this week by the *Financial Times*.

* * *

PROGRESS in packaging technique and the marked development of automatic and mechanised processes in producing metal containers to unvarying high standards of accuracy are described in a new brochure now available from F. Francis & Sons, Ltd., London. The brochure commemorates the jubilee of the incorporation in 1900, although the firm's career goes back 30 years before that.

* * *

THE case for a separate boiler for each bottle washing machine is made in a brochure issued by the Potterton Gas Division of Thomas De La Rue & Co., Ltd. Working details of gas-fired boilers in conjunction with detergent injection are given.



[By courtesy of General Electric Co., Ltd., London

Two pieces of solid metal separated by wire gauze, as used in types of insect-proof screens. This is one of the many applications of cold pressure bonding to form joints difficult to achieve by any of the usual welding methods

APPLICATION of mercury drop control to derivative and differential polarography is described by L. Airey and A. A. Smales in the June issue of *The Analyst* (Vol. 75, No. 891), journal of the Society of Public Analysts and Other Analytical Chemists.

* * *

NOTES on the formation of nodular cast iron by the cerium and magnesium processes are a feature of "Foseco Foundry Practice," the hundredth issue of which is just issued by Foundry Services, Ltd.

* * *

EQUIPMENT for industrial battery charging is the subject of a new catalogue (ref. V.1014) now available from the General Electric Co., Ltd., London. A good description is given of the functions and advantages of selenium rectifiers.

* * *

A NEW monthly journal, *Indian Doctor*, makes its first appearance in India this month. Published in English it will contain articles on health and various branches of medical knowledge. The editor is Dr. Man Singh, principal, Old Indian Medical College.

OVERSEAS

German Chemicals for the Argentine

Under a trade pact to be signed shortly between the Argentine and Western Germany, the principal exports from the latter will include chemicals and drugs valued at $12,000 to be exchanged for grains, meat and meat products. Although classed as a government pact, the major part of its operation will be carried out through private channels.

Italian Metallurgy Award

A foundation to commemorate Professor Luigi Losana has been promoted by the Italian Association of Metallurgists, who are holding a national convention from September 28 to October 1, 1950. An award of a medal will be made every two years to the research worker of any nationality who has contributed most to the knowledge of metals.

New Type of Chromed-Steel Rod

The Kenmore Metals Corporation, New Jersey, has announced a new type of chromed-steel rod suitable for bending or welding without damage to the chromed surface. The rod is produced by a two stage electro-plating process in which nickel is first intimately bonded to a steel rod. Chromium is then electro-plated over the nickel to provide a hard, high lustre and permanent finish.

Higher U.S. Tariffs

Tariffs on lead imported into the U.S.A. from Australia, Canada and Peru will be doubled from the end of the year. This is the result of the termination on December 31 of the trade agreement between Mexico and the United States, under which many other nations enjoy tariff benefits. About half the oil imported, including that from the Middle East, will also be affected.

Norway Reduces Coal Production

The Store Norske Spitsbergen Kullkompani has decided to stop working one of its two coal mines at Longyear, Spitsbergen, on account of the increasing difficulties in disposing of the coal to markets outside Norway. The bulletin of the Royal Norwegian Information Service in London, referring to this, mentions that the total production at Spitsbergen this year was estimated at about 350,000 tons. The reduction, probably by about 50,000 tons, was influenced by the fact that an increasing number of ships are being converted to oil burners.

Yugoslav Lead Development

Prospecting in the Zletovo lead mines in Macedonia has revealed new seams, some in the vicinity of the old workings, and the whole are said to promise ample supplies for the next 10 to 15 years. New shafts are being sunk and 2700 ft. of new tunnelling is being completed.

Belgian Oil Refining

In his report to the recent 2nd annual general meeting of Albatros S.A. Belge pour le Raffinage de Pétrole, the president, Maître Léon Ponet, stated that during 1949 the refinery processed a total of about 127,000 tons of crude oil, all from the Middle East, out of a total Belgian refinery throughput of 350,000 tons. This is at present the largest annual throughput of any single refinery in Belgium.

Norwegian Nitrate

Nitrate production by the Norsk Hydro Company in 1949 reached a record total of 100,000 tons. It is hoped that by 1952 output will be 175,000 tons yearly. A further sum of 500,000 crowns has been set aside for research by the Norwegian Nitrate Company, which has already devoted 1.7 million crowns to this purpose. The company is also to give 400,000 crowns towards establishment of a technical and scientific research institute.

New Source of ACTH

It was announced on June 15 that workers at F. W. Horner, Ltd., Montreal, have succeeded in extracting ACTH from cattle glands. Previously, ACTH had been produced only from hog glands in the U.S.A. and it was not thought practical to extract it from cattle pituitaries. Experimentally, ACTH has been used for relief of arthritis and other diseases. Because of the scarcity and high cost of ACTH, extraction from cattle glands may prove of great interest to medical circles.

ECA Aid for New Caledonia Nickel

ECA authorities in Paris have announced an agreement with the French Government whereby $965,000 worth of U.S. equipment is to be provided for the modernisation and development of nickel production in New Caledonia. The agreement provides for the delivery, for the U.S. stockpile, of nickel of an amount related to the dollar advances. It is intended to raise the New Caledonia nickel output from the pre-war rate of 6000 to 7000 tons to 10,000 to 12,000 tons per annum.

HOME

Scottish Ceramic Materials

The Scottish Council (Development and Industry) is to appoint a committee to investigate the status of the ceramic, pottery, brickmaking and building materials industries in Scotland. A grant is being sought from the Secretary of State for Scotland. The Council also propose to create a Minerals Research Centre to examine and develop the lower grade mineral resources of Scotland.

Coal Production

Output of deep-mined coal last week showed a net decrease of 80,000 tons from the previous week. The estimated loss on account of 65 pits taking their annual week's holiday was nearly 152,000 tons. Comparative figures are:—Last week: 4,276,600 tons (deep-mined 3,994,600 tons, opencast 282,000 tons; previous week: 4,353,700 (deep-mined 4,074,500 tons, opencast, 279,200 tons).

Industrial Radiology Meetings

The summer meeting of the industrial radiology group of the Institute of Physics will be held at the New Horticultural Hall, Victoria, London, July 25 to 28 inclusive. Admission to the lectures and group summer exhibition, and to the technical exhibition of the International Congress of Radiology, will be by ticket only, obtainable free from the Institute of Physics, 47 Belgrave Square, London, S.W.1.

Training Centre Becomes a Factory

The Ministry of Works has approved the use of a former Government training centre at Paulsgrove, Portsmouth, as a factory to be used by Johnson & Johnson, principally for the manufacture of surgical dressings. The fact that some 4000 are unemployed in Portsmouth influenced the decision to use the building for industry, rather than as a school. The new industry will employ approximately 325 men and women, and later 500.

Hydraulic-Pneumatic Starter Device

Bryce Fuel Injection, Ltd., Staines, Middlesex, have acquired the rights to manufacture and market here and in many countries overseas a new type of hydraulic engine starter, particularly suited to oil engines, which requires no outside source of energy. Hand-operated, it employs an ingenious combination of pneumatic and hydraulic principles.

Textile Technologists

Sixteen technical colleges and schools in England and Scotland have entered 301 students for this year's examinations for National Certificates in Textiles. This is the largest entry recorded since the scheme—organised by the Textile Institute in conjunction with the Ministry of Education—was inaugurated in 1935.

Electrical Power Convention

Among the exhibits of interest to the chemical and allied trades which were on view at the British Electrical Power Convention, held at Harrogate from June 19 to 23, was that of Henry Wiggin & Co., Ltd., one of the largest producers in Europe of wrought nickel products and nickel-chromium alloys. A feature of this stand was a scale model of the new Ruston & Hornsby gas turbine, claimed to be the first British gas turbine designed throughout as prime mover designed for long service. This employs one of the Nimonic series of alloys for the blades, which operate in conditions of high stress at high temperature.

Deterioration of Coal

Deterioration of the quality of coal supplies was referred to by Mr. J. D. Pealtie, deputy chief engineer (generation) of the British Electricity Authority, in an address to the British Electrical Power convention in Harrogate last week. Coal now being supplied and used in British electricity generating stations, he said, would have been regarded as unsaleable 30 years ago.

Uncleaned coal supplied had increased from 7 million tons in 1939 to more than 17 million in 1948. Ash content of all deliveries had risen from 11.4 per cent in 1939 to 15.4 per cent in 1947.

Faults in Welding

Typical faults which can occur during the use of arc welds of mild and low alloy structural steel are defined in a booklet just issued by the British Welding Research Association. There are 44 illustrations showing typical faults, and an outline is given of their cause and how they may be avoided and corrected. The booklet, entitled "Memorandum on Faults in Arc Welds and Mild and Low Alloy Steels" (2s. 6d.), is reprinted from "Welding Research" (Vol. 4, No. 1, February 1950).

PERSONAL

Trade and Official Appointments

SIR HENRY TIZARD, who is 65 and has been scientific adviser to the Minister of Defence since 1947, will in future carry out this responsibility on a part-time basis only, continuing as chairman of the Defence Research Policy Committee. SIR FREDERICK BRUNDRETT will take up the post as his deputy from today (July 1). Sir Frederick, who was appointed chief of the Royal Naval Scientific Service in 1947, was knighted in January. During the war he was largely responsible for the mobilisation of scientists and scientific workers in the Government service.

DR. G. A. JEFFREY, who supervises research in the X-ray section of the chemistry department, Leeds University, has been invited by Pittsburg University to form a similar section and to serve as visiting professor for ten months. Dr. Jeffrey, who is 35, has specialised in the investigation of molecular structure by X-rays. He will leave for the U.S.A. in December.

SIR EDWARD APPLETON was described as "one of the chief magicians of the twentieth century" at the Commemoration Day celebrations, last week, at Glasgow University, at which the honorary degree of LL.D. was conferred upon him and upon PROF. ROBERTUS TODD.

MR. C. E. J. SENDALL and MR. A. J. JONES have retired from the board of Evans Medical Supplies, Ltd., after 42 and 33 years' service respectively. Mr. Sendall joined the firm in 1908 and became production director of the new workshops at Speke in 1943. Mr. A. J. Jones, who has specialised in biochemistry, joined Evans in 1918 to undertake pharmaceutical process research, and nine years later took charge of the Fine Chemical Works, Runcorn.

MR. J. P. HUNT, managing director of the Hallamshire Steel & File Co., Ltd., has been appointed chairman of the National Association for Rolled and Re-Rolled Steel Products in succession to MR. H. C. WATERSTON, vice-chairman of Bairds & Scottish Steel, Ltd.

MR. L. J. E. HOOPER, chairman and joint managing director of Doulton & Co., Ltd., has resigned as joint managing director but retains his office as chairman. MR. E. BASIL GREEN has been appointed managing director of the company as from July 1.

(*continued at foot of next column*)

"RESISTANCE MOVEMENT"

Widening Support for Individualism

THE undiminished respect accorded to those who have unwaveringly maintained the rights and responsibilities of the individual against all the incursions of the State in its many guises received a strong testimony at a luncheon in London on June 22, which nearly 400 attended, commemorating the 25th anniversary of the Society of Individualists. The occasion celebrated the 75th birthday of the guest of honour, Sir Ernest Benn, a founder of the society who has untiringly championed the cause of the individual.

Dr. C. K. Allen, presiding in the absence, through illness, of Lord Lyle of Westbourne, disclosed that members had donated nearly £2000 to provide some commemorative gift to Sir Ernest, who had chosen that the money should be used in widening the society's work. The chairman observed that, for his energy, enterprise, burning zeal and keen-edged dialectic, their founder-member would be remembered as an outstanding personality in his generation.

The characteristic of courageous independence was commended in warm terms by Sir William Darling, who described the principal guest as the leader of a resistance movement in the fight for individual freedom and liberty.

Sir Ernest Benn, in response to a toast, recalled the inception of the society and the inspired support quickly accorded to it by outstanding individuals at that time, by Arthur Balfour, Edward Grey, Eric Geddes, Nigel Playfair, Roger Keyes, Walter Runciman, William Plender and others. They asked for no votes, he recalled. They declined to take part in multi-party folly. They set forth one simple purpose of making it clear that "the State can't do it", and that it was in fact the citizen who kept the State and not the State the citizen.

The decline in many standards in this country, particularly those of national prosperity and in individual integrity, had been more or less continuous since 1910, when the politicians thought they would take a hand in the business of economic progress.

MR. J. H. LORD, one of the Dunlop Rubber group's executive directors, has been elected vice-president of the Federation of British Rubber Manufacturers' Associations.

The Stock and Chemical Markets

THE serious news from Korea caused a general reaction in stock markets, led by British Funds, which were marked back sharply following their recent advance. Falls on Monday in long-dated stocks ranged up to 35s. in 3½ per cent Conversion, while 3½ per cent War Loan fell 32s. 6d. at £93 and declines of 22s. 6d. were shown in 2½ per cent Treasury Bonds and 2½ per cent Consols. Later, conditions steadied and the lower prices attracted buyers.

Leading industrial shares were generally 1s. lower on balance, and there were falls of up to 5s. in gold mining shares earlier in the week. There was no heavy selling, although sections which have recently rallied well reacted sharply. The fall was largely due to precautionary marking down by jobbers.

Shares of chemical and allied companies have reflected the general trend, falling heavily on Monday but later showing a moderate recovery. Imperial Chemical at one time fell to 40s., a reduction of 1s., but firmed up to 40s. 3d. at the time of writing. Fisons, after their recent rise on the interim dividend and the directors' confirmation that a total dividend of 9 per cent is expected on the larger capital, rose to 26s. 6d., but later came back with the market trend to 25s. 6d. Monsanto eased to 49s., Associated Cement to 85s. 3d., while British Aluminium fell 1s. 3d. at 40s., British Oxygen at 97s. lost part of their recent rise, and Borax Consolidated eased to 55s. 6d. and Dunlop Rubber to 60s. 1½d. Turner & Newall at 82s. lost 1s. 7½d. earlier in the week and United Molasses came back to 43s. 4½d.

Glaxo Laboratories were at one time 1s. 3d. down at 47s. 6d., but later rallied to 48s. British Match reacted to 37s. and British Plaster Board were back to 15s. 4½d. following the financial results, although the latter were in accordance with general expectations. Despite the interim dividend, British Industrial Plastics eased to 5s. 10½d. Kleemann lost 7½d. at 8s., De La Rue receded to 23s. and British Xylonite were back to 77s. 6d. The 4s. units of the Distillers Co. eased to 18s. 4½d., although the market expects the forthcoming results to be received favourably.

Iron and steels kept relatively steady, declines on balance not generally exceeding more than 6d. Guest Keen, after their recent rise, were back at 45s. Stewarts & Lloyds were 6d. down at 45s. 6d., United Steel eased to 25s. 10½d. and Vickers to 29s. 1½d. Staveley were 4½d. easier at 81s. 4½d.

Boots Drug were 6d. down at 47s. 3d., Triplex Glass at 23s. 10½d. lost part of their recent advance, but United Glass Bottle were unchanged at 75s. Lever & Unilever at 41s. 1½d. lost part of the rise which followed the good impression created by the financial results.

Oils' reaction to the general trend was evidenced by Anglo-Iranian losing 3s. 9d. earlier in the week and Shell 2s. 6d. Burmah, however, came back 1s. 10½d. There was a heavy fall in Ultramar Oil to 13s. 6d. following publication of the results and the debentures were £20 down at £135.

Market Reports

A STEADY home trade continues in most sections of the industrial chemicals market and the volume of inquiry for shipment has been reasonably good. The Convention prices of red and white lead have been decreased owing to a reduction in the controlled price of pig lead—as was suggested last week. The new basis price for dry white lead is £120 per ton and for dry red lead £110 10s. per ton. Quotations elsewhere generally remain unchanged. Among the soda products, caustic soda and soda ash are in active request and there is a ready outlet for sodium sulphide and sodium bicarbonate. Other items in good call are hydrogen peroxide and formaldehyde. Conditions on the coal tar products market remain steady. Phenol is firmer on a good demand and there is a reported U.S.A. demand for benzol.

MANCHESTER.—Values of heavy chemical products on the Manchester market have been well held and the undertone generally is firm. Home-trade users of the soda compounds are taking good deliveries, and a steady demand is reported for most of the potash, ammonia and magnesia compounds. Most other industrial chemicals are finding a ready outlet on the home market. Shippers' inquiries during the week have been on a fair scale. In the tar products markets the benzols and other light distillates are in steady request, and there has been a moderate business in the pale and other grades of cresylic acid.

GLASGOW.—Business in general has been steady, but there is a definite tendency for smaller quantities to be ordered. There has been considerable activity in solvents for export.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

BLACKPOOL STAINLESS PLATERS, LTD. (M., 1/7/50.) May 30, deb., to Mosley Street Nominees, Ltd., securing all moneys due or to become due to Williams Deacon's Bank, Ltd.; general charge.

DAVEY & MOORE, LTD., Brimsdown, glass bottle manufacturers. (M., 1/7/50.) May 26, £370 guarantee and charge to Provincial Building Society; charged on certain moneys. *Nil. Oct. 12, 1949.

MARINE PAINTS & COMPOSITIONS, LTD., Surbiton. (M., 1/7/50.) May 26, £10,000 charge, to C. T. C. Chandless, Selmeston; charged on land with factory and buildings thereon at Chessington. *Nil. Dec. 28, 1949.

REDDITCH ELECTRO PLATING CO., LTD. (M., 1/7/50.) May 30, deb., to Barclays Bank, Ltd., securing all moneys due or to become due to the Bank; general charge. *£8103. Dec. 31, 1948.

TRIMITE, LTD., Greenford, paint manufacturers, etc. (M., 1/7/50.) June 1, charge, to Westminster Bank, Ltd., securing all moneys due or to become due to the Bank; charged on 86 Burnham Avenue, Uxbridge. *Nil. July 15, 1949.

BATTERY MAKERS OF IRELAND, LTD., Dublin. (M., 1/7/50.) April 28, £50,000 debenture, to The Chloride Electrical Storage Co., Ltd.; charged on premises at Stannaway Drive, Crumlin, Dublin, held under certain leases, also general charge. *Nil. June 29, 1949.

Satisfactions

MANNAH, LTD., chemists, Skegness. (M.S., 1/7/50.) Satisfaction June 3, of mortgage registered January 14, 1946.

CHARLES MOORE & CO., LTD., salt manufacturers, Liverpool. (M.S., 1/7/50.) Satisfaction June 2, of amount outstanding July 1, 1908.

Receivership

EUCOS PRODUCTS, LTD., manufacturers of pharmaceutical, chemical and cosmetic preparations, etc., 11a Carlisle Road, Hendon, N.W.9. (R., 1/7/50.) Mr. William E. Carnelley, 14 George Street, Mansion House, E.C.2, was appointed receiver on June 6.

Increases of Capital

The following increases in registered capital have been announced:—METROPOLITAN CHEMICALS (LONDON), LTD., from £300 to £10,000; TIDEBROOK CHEMICAL PRODUCTS, LTD., from £5000 to £10,000; RADIOL CHEMICALS, LTD., from £100 to £2000; ELTIBAR DEVELOPMENTS, LTD., from £300 to £2000.

Company News

Yorkshire Dyeware and Chemical Co., Ltd.

Group profit of the Yorkshire Dyeware & Chemical Co., Ltd., after all charges, including tax, was £63,511 (£119,591). The final dividend of 1½ per cent (12½), making for the year 10 per cent (17½), is on the doubled capital of £500,000.

New Registrations

Pectosol Corporation, Ltd.

Private company. (483,503). Capital £20,000. Research workers, farmers, etc. Directors: Conrad L. Walsh, director of A.S.P. Chemical Co., Ltd. Lewin E. Parsons. Reg. office: 6 Bishopsgate, E.C.2.

Mirrlees Pingris Blairs Chemical Plant Co., Ltd.

Private company. Capital £5000. Selling agents of chemical plant. Solicitors: Maclay, Murray & Spens, 169 W. George Street, Glasgow.

Norton & Richard Laboratories, Ltd.

Private company. (483,434). Capital £500. Manufacturers of laboratory reagents, chemicals, gases, etc. Directors: Stephen Z. Norton and Michael L. Johnhouse. Reg. office: 31 Kings Road, Sloane Square, S.W.3.

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2. at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Process for the production of unsaturated carbonylic compounds.—N.V. De Bataafsche Petroleum Maatschappij. Aug. 5 1947. 640,383.

Copolymers of dipropenyl esters.—United States Rubber Co. Aug. 18 1947. 640,468.

Oxygen-producing plant.—F. T. Conder. March 9 1949. 640,389.

Process for the cementation of steel.—Gaz De France Ex-Soc. d'Eclairage Chauffage et Force Motrice. Oct. 6 1947. 640,289.

Activating the oxidising power of chlorite solutions and bleaching of cellulosic material therewith.—Solvay & Cie. Oct. 29 1947. 640,394.

Method of making non-metallic fuel tanks.—United States Rubber Co. Oct. 30 1947. 640,298.

Drying oil-dimer copolymers and process of preparing same.—Standard Oil Development Co. Nov. 7 1947. 640,474.

Peelable wax-containing coating compositions.—N.V. De Bataafsche Petroleum Maatschappij. Dec. 12 1947. 640,476.

Production of wear-resistant iron-alloy surfaces.—Soc. d'Application des Traitements de Surface. Dec. 16 1947. 640,536.

Preparation of ketones.—United States Rubber Co. Dec. 19 1947. 640,479.

Production of hydroxy ketones from acetylenic alcohols.—Polymerisable Products. Dec. 22 1947. 640,477.

Complex salts of stabilised rosin amine.—Hercules Powder Co. Jan. 12 1948. 640,402.

Production of o-hydroxy-phenyl glycerol ether.—British Drug Houses, Ltd., W. Bradley, B. N. Feitelson, and R. M. Lodge. Jan. 7 1949. 640,403.

Process for the production of hydrocarbons and oxygenous derivatives thereof.—N.V. De Bataafsche Petroleum Maatschappij. Jan. 15 1948. 640,311.

Process for the manufacture of substituted phenols.—Beck, Koller & Co. (England), Ltd. Feb. 5 1948. 640,485.

Reclamation of metals or alloys from composite alloy materials or articles.—E. P. Harris, and F. J. Trostler. March 11 1949. 640,320.

Organic fluorine compounds.—E. I. Du Pont de Nemours & Co. Feb. 18 1948. 640,486.

Liquid phase polymerisation of styrene compounds.—Distillers Co., Ltd., and H. M. Hutchinson. March 3 1949. 640,413.

Manufacture of methylene-lactones.—E. R. H. Jones, and M. C. Whiting. March 7 1949. 640,489.

Methods of preparing aminoketones or their reduction products or salts thereof. N.V. Philips' Gloeilampenfabrieken. April 14, 1948. 640,492.

Plasticisation of polymeric hydrocarbons.—I.C.I., Ltd., F. W. Lord, T. J. Meyrick, and L. B. Morgan. May 2 1949. 640,494.

Production of gamma-ferric oxide hydrate and gamma-ferric oxide.—Columbian Carbon Co. June 14 1948. 640,438.

Purification of hydrogen chloride.—I.C.I., Ltd., and C. Carter. Aug. 18 1949. 640,444.

Methods of and means for growing crystals.—Brush Development Co. June 15 1944. 640,982.

Process for the manufacture of calcium aluminates.—J. C. Seailles. Aug. 29 1946. 640,905.

Method of producing normally gaseous fuels from carbon-containing materials.—C. Arnold (Standard Oil Development Co.). Sept. 10 1946. 640,907.

Process and apparatus for drying, cooling and deodorising soap.—G. Mazzoni. Sept. 17 1946. 640,908.

Purifying of organic dyestuffs.—Chadeloid Corporation. Feb. 13 1947. 640,915.

Methods of blackening stainless steel.—Alloy Research Corporation. May 13 1947. 641,091.

Surface active agents and process of making same.—Sun Chemical Corporation. May 21 1947. 640,924.

Chlorinated thiophenes and insecticides and fungicides containing them.—Pennsylvania Salt Manufacturing Co. June 18 1947. 641,094.

Process for the manufacture of acid dyestuffs of the anthraquinone series.—Sandoz, Ltd. July 3 1947. 640,931.

Textile treatment compositions.—British Celanese, Ltd. July 10 1947. 640,989.

Process for affecting catalysed endothermic reactions.—Universal Oil Products Co. July 22 1947. 640,984.

Insecticidal compositions.—Harvel Corporation. July 30 1947. 640,991.

Treating hydrocarbon oils to reduce the sulphur content thereof.—Socony-Vacuum Oil Co, Inc. July 31 1947. 640,994.

Glass for forming glass-to-metal seals.—Marconi's Wireless Telegraph Co., Ltd. Aug. 13 1947. 640,943.

Methods of and means for growing crystals.—Brush Development Co. June 15 1944. 640,999.

Synthetic lubricant.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Aug. 29 1947. 640,945.

Evaporating or concentrating apparatus.—W. C. Mason and W. W. Hutcheson. Sept. 3 1947. 640,946.

Ammonia evaporation plant particularly for refrigerated transportation systems.—Standard Cap & Seal Corporation. Sept. 19 1947. 641,000.

Process for the refining of paraffin waxes.—Standard Oil Development Co. Oct. 6 1947. 640,949.

Method for the production of streptomycin involving the use of a fermentation medium containing yeast.—Merck & Co., Inc. Oct. 13 1947. 640,950.

Refrigerated transportation units.—Standard Cap & Seal Corporation. Oct. 16 1947. 641,004.

Absorption refrigerating apparatus of the inert gas type.—Electrolux, Ltd. Oct. 31 1947. 641,007.

Purification of penicillin.—E. Lilly & Co. Nov. 12 1947. 641,009.

Nylon fabrics.—Imperial Chemical Industries, Ltd. Dec. 3 1947. 640,960.

Production of pyrazoles. — General Aniline & Film Corporation. Dec. 5 1947. 641,015.

Installations for cathodically protecting underground metallic structures.—Aluminum Co. of America. Dec. 24 1947. 641,021.

Anode packages for use in cathodic systems for protecting underground metallic structures.—Aluminum Co. of America. Dec. 24 1947. 641,022.

Preparation of reduction products of N-phenyl-3, 5-diethyl-2-propyldihydropyridine.—B. F. Goodrich Co. Jan. 19 1948. 640,026.

Preparation of catalysts. — Anglo-Iranian Oil Co., Ltd., J. Owen, L. C. Strang and J. N. Haresnape. Jan. 27 1949. 640,965.

Electric battery cells using air as a depolariser.—Soc. le Carbone-Lorraine. Feb. 2 1948. 641,028.

Apparatus for testing temperature distribution.—F. H. Stark. Feb. 21 1949. 640,971.

Method for the preparation of peptone and amino-acid containing extracts from press water.—C. Drangsholt. March 16 1948. 641,120.

Catalytic improvement of hydrocarbon synthesis product.—Standard Oil Development Co. March 18 1948. 641,121.

Manufacture of thiourea.—Soc. Anon. Des Manufactures Des Glaces Et Produits Chimiques De St.-Gobain, Chauny, & Cirey. April 1 1948. 640,976.

Recovery of chlorobenzene. — United States Rubber Co. May 14 641,041.

Evaporator calorimeters.—Odin Clorius Aktieselskabet. Aug. 16 1948. 641,058.

Heat-exchange apparatus. — H. N. Skerrett (Aktiebolaget Rosenblads Patenter). Aug. 26 1948. 641,153.

Porcelain glaze compositions.—British Thomson-Houston Co., Ltd. Sept. 21 1948. 640,872.

Manufacture of glass tubing.—H. G. Flood. Oct. 24 1949. 640,878.

Processes for forming lead dioxide plates for lead-acid cells.—W. F. K. Jones, R. Wynne-Lind and R. J. Doran. Sept. 27 1948. 641,159.

Anisotropic permanent magnet alloys.—W. Jessop & Sons, Ltd., D. A. Oliver, and D. Hadfield. Aug. 13 1949. 640,886.

CLASSIFIED ADVERTISEMENTS

SITUATIONS VACANT

CHEMICAL ENGINEERS. Excellent prospects and permanency offered to experienced Chemical Engineers by The Bahrein Petroleum Company Limited, Persian Gulf. Applicants must possess a B.Sc. Degree or equivalent from a recognised Engineering School. Men, who in addition to their Chemical Engineering training, have had training in Mechanical Engineering and practical experience in designs problems applicable to the distillation and fractionation of hydrocarbons common to crude oil and coal-tar refining or chemical plants and other allied industrial processes, are preferred. Salaries according to qualifications and experience, plus kit allowance, provident fund, free board, air-conditioned living accommodation, medical attention and transportation costs. Agreements, 24 to 30 months, with paid leaves. Write, giving full particulars of qualifications, age, education, experience and salary required, to **Box 3427, c/o Charles Barker & Sons, Ltd., 31, Budge Row, London, E.C.4.**

CIVIL ENGINEERS. Excellent prospects and permanency with Bahrein Petroleum Company Limited, for Civil Engineers not over 40 years of age with Degree and experience of design and erection of steel and reinforced concrete supporting structures as encountered in oil refinery or similar heavy chemical process plants. Twenty-four to thirty months agreements, with passages paid, kit allowance, provident fund, paid leaves, free messing and air-conditioned accommodation. Low living costs. Write, with full particulars of age, experience, education and salary required, to **Box 3428, c/o Charles Barker & Sons, Ltd., 31, Budge Row, London, E.C.4.**

DESIGNS ENGINEERS. Excellent prospects and permanency with Bahrein Petroleum Company Limited, for Mechanical Engineers, not over 40 years of age, with B.Sc. Degree or equivalent qualifications. Experience required in design and/or construction of oil refineries, coal-tar, chemical distillation plants, or similar involving electrical and steam systems, pressure vessels, fractionating columns, heat exchanges and pumping equipment. Twenty-four to thirty month agreements, with passages paid, kit allowance, provident fund, paid leaves, free messing and air-conditioned accommodation. Low living costs. Write, with full particulars of age, experience, education and salary required, to **Box 3429, c/o Charles Barker & Sons, Ltd., 31, Budge Row, London, E.C.4.**

NORTH WESTERN GAS BOARD
LIVERPOOL UNDERTAKING

APPOINTMENT OF THREE ASSISTANT CHEMISTS

APPLICATIONS are invited for the positions of Assistant Chemists on the staff of the Liverpool Undertaking.

Applicants should have had industrial experience, not necessarily in the Gas Industry, and preference will be given to those holding a Science Degree or Associate Membership of the Royal Institute of Chemistry.

The commencing salary will be within the range of £450 to £650, depending on qualifications and experience. The successful candidates may be required to pass a medical examination and to subscribe to such scheme of superannuation as the Board may adopt in future.

Applications, giving details of qualifications and experience of the candidate, and with the names of two referees, should be forwarded to the **Personnel Superintendent, Radiant House, Bold Street, Liverpool 1.** not later than 10 days after the appearance of this advertisement.

SITUATIONS VACANT

MALE LABORATORY ASSISTANTS required by old established firm of Chemical manufacturers, with view to training as shift chemists. Commencing salary not less than £250 p.a. plus additional pay when working shifts. Full particulars to, Box C.A. 2930, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

PROJECTS ENGINEER, with Chemical Engineering background, and/or experience in the Oils and Fats Industry, required for interesting position. Only candidates capable of working conscientiously and on own initiative need apply to

BAMAG LIMITED (MKS.),
Rickett Street, London, S.W.6.

TECHNICAL SALES ENGINEER required by well known firm of Chemical Engineers in London. Work involves following-up by personal interview tenders made for a wide variety of plant; discussion of new projects with clients and all activities required to obtain orders for chemical plant. Qualifications required: 1. Good training in engineering. 2. Practical experience in chemical works an advantage. 3. Real understanding of principles of chemical engineering unit process. 4. Good personality. 5. An enthusiasm for hard work and getting orders. No commisions paid. It is essential that the applicant should live either in London or in the North East of England or Midlands. Write stating age, previous experience and salary required to Box No. C.A. 2927, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

THE Civil Service Commissioners invite applications for 12 permanent appointments as **AREA GAS EXAMINER** (male) in the Ministry of Fuel and Power.

Candidates must have been born on or before 1st May, 1924. They must have either a University Degree in Chemistry or Physics or be Associate Members of the Royal Institute of Chemistry or the Institute of Physics or the Institution of Gas Engineers, and should preferably, have at least two years experience in gas calorimetry. Candidates who do not possess any of the qualifications referred to will be considered, providing they have at least ten years experience in gas calorimetry.

Inclusive London salary scale, £700×£25–£850. Rather less in the Provinces.

Further particulars and application forms from the **Secretary, Civil Service Commission, Scientific Branch, 7th Floor, Trinidad House, Old Burlington Street, London, W.1,** quoting No. 3145 TD. Completed application forms must be returned by 27th July, 1950.
7426/150/JW

FOR SALE

PULVERISING PLANT (300 MESH). RAYMOND LOPULCO PULVERISING PLANT by International Combustion Ltd., for fine grinding (passing 300 mesh), all complete including standard type R.L. 7. Raymond Lopulco Mill with Rotary Feeder, one Double Cone Raymond Mechanical Type Separator, one Single Cone Separator, Tubular Stocking Dust Collector, Double Type Exhauster, 50 h.p. S.C. motor standard voltage, Ellison Oil Immersed Starter, etc.

BARBER'S CHEMICAL PLANT CO., LTD.,
86/88 RICHMOND ROAD, KINGSTON-ON-THAMES, SURREY.

Telephone: **KIN**gston 1423.

FOR SALE

600

MIXING MACHINES

TWO **BLAIR CAMPBELL** Jacketed Trough **MIXERS.** Copper-lined troughs, 4 ft. 6 in. by 3 ft. 6 in. by 3 ft. deep, with twin "Z" blades and glanded bearings. Counterbalanced domed cover. Hand-operated tilting. Pulley driven through gearing. 15 h.p. required to drive.

MELVIN Steam-jacketed Trough **MIXER,** 3 ft. 2 in. by 2 ft. 9 in. by 2 ft. 6 in. deep. Twin Naben blade agitators with glanded bearings. Mechanical tipping off main drive. Trough tin sprayed internally. Drive by 10 h.p. slipring motor 200/3/50, by B.T.H. through Radicon reduction gear.

Six Jacketed **MIXERS** by **BAKER PERKINS.** Trough, 31 in. by 28½ in. by 28 in., twin Naben-type blade agitators. Hand-operated tilting. Trough fitted aluminium cover. Direct drive by T/E geared B.T.H. motor, 400/440/3/50.

Three Double-trough Type Jacketed **MIXERS** by **WERNER PFLEIDERER.** Trough, 24½ in. by 24½ in. by 19½ in. deep, fitted double-fin type agitators. Driven at variable speeds through single machine-cut gearing from clutch-operated driving and reversing pulleys. Hand-operated tilting. Agitators can be used whilst tilting. 10/15 h.p. required to drive.

Horizontal **MIXER** by **KRUPP.** Internal dimensions, 5 ft. by 5 ft. by 5 ft. Non-tilting, double-trough type, heavy twin "Z" blades. Bottom slide discharge. Drive by 50 h.p. 480V. D.C. motor through gearing.

Eight Double-trough Type Jacketed **MIXERS** by **WERNER PFLEIDERER.** Internal dimensions, 2 ft. 4½ in. by 2 ft. 5 in. by 2 ft. 3½ in. deep. Fitted twin double-fin type agitators, driven through gearing by pulleys. Hand-operated tilting. 10/15 h.p. required to drive.

Horizontal Steam-jacketed Phosphor-bronze Tilting **MIXER** by **MELVIN,** 2 ft. 5½ in. by 2 ft. 2½ in. by 2 ft. deep. Twin PB double Naben type agitators. Hand-operated tilting. Drive by pulleys through gearing. Pulleys complete with belt striking gear.

Three C.I. Horizontal Double-trough, Steam-jacketed **MIXERS** by **SMEDLEY.** Internal dimensions, 3 ft. 6 in. by 3 ft. 6 in. by 2 ft. 3 in. deep. Double Naben type agitators. Fast and loose pulley drive. Power tilting, clutch operated.

DUPLEX MIXING and Kneading Machine by **MORTON OF WISHAW.** Steam-jacketed trough, 42 in. by 38 in. by 30 in., working capacity, 115 gallons. Fitted twin gunmetal double Naben type agitators. Counterbalanced lid secured by quick-release clamps. Int. W.P., 15 lb. sq. in. or high vacuum, 30 lb. sq. in. in jacket. Power-operated tilting. 25/30 h.p. required to drive.

GEORGE COHEN SONS & CO., LTD.,
SUNBEAM ROAD, LONDON, N.W.10.
Tel.: Elgar 7222 and
STANNINGLEY, Nr. LEEDS.
Tel.: Pudsey 2241.

COPPERAS

FINE Quality Centrifuged **SNOW CRYSTAL COPPERAS** continuously available in quantity. Supplied in bags or open road wagon to suit customers' requirements. Price reasonable. Contract or general inquiries invited.

Exors. of JAMES MILLS LTD.,
Bredbury Steel Works,
Woodley,
Nr. STOCKPORT.

FOR SALE

VARIOUS MIXERS FOR SALE

No. 200 ONE nearly new **WERNER PFLEIDERER JACKETED MIXER OR INCORPORATOR.** Low type, with C.I. built mixing chamber, 28 in. by 29 in. by 27 in. deep, with double "U"-shaped bottom which is jacketed, and double fish-tail or fin-type agitators geared together at one side, with belt-driven friction pulleys, 34 in. diam. by 5 in. face, with hand-wheel operation and hand-operated screw tilting gear. Machine fitted with machine-cut gears, covers, gear guard, cast-iron baseplate, and measuring overall approximately 7 ft. by 6 ft. by 4 ft. high to the top of the tipping screw

No 204 One **WERNER PFLEIDERER MIXER OR INCORPORATOR,** similar to the above, with a C.I. built pan 25 in. by 25 in. by 19 in. deep, belt pulleys 26 in. diam. by 5 in. face, double fin-type agitators, and mounted on C.I. legs.

No. 205 One larger **WERNER-TYPE MIXER OR INCORPORATOR,** by Dobson & Barlow, with C.I. built pan or mixing chamber, of the double "U" type, 4 ft. 6 in. by 3 ft. 7 in. by 3 ft. 10 in. deep, with a jacketed bottom and sides to within about 12 in. of top, and fitted with double "Z" type agitators, counterbalanced cover, machine-cut gears at each side, steel backframe with counterbalancing weights and self-contained belt-driven tipping gear and main triple fast and loose belt pulleys 30 in. diam. by 6½ in. face, with belt fork. Approximate overall sizes, 12 ft. long by 8 ft. wide by 10 ft. high.

No. 206 One **DITTO** of the same pattern, by **DOBSON & BARLOW**

No. 208 One **DITTO** by **WERNER PFLEIDERER,** with a C.I. built pan or mixing chamber, of the double "U" type, 4 ft. 5 in. long by 3 ft. 8 in. by 33 in. deep, with double "Z" mixing arms, gears at each end, hand-operated tilting gear, with steel backframe, counterbalancing weights and chains, and fast and loose pulleys 3 ft. diam. by 6 in. face.

No. 209 One **HORIZONTAL "U"-SHAPED MIXER,** steel built, riveted, measuring about 8 ft. 3 in. long by 3 ft. wide by 3ft. 3 in. deep, with horizontal shaft, fitted with bolted-on mixing arms about 18 in. long by 4 in. wide, with intermediate breakers, and driven at one end by a pair of spur gears, with countershaft, fast and loose belt pulleys, outer bearing and plug cock type outlet at the opposite end, mounted on two cradles fitted to two R.S.J. running from end to end.

No. 210 One **HORIZONTAL MIXER** as above.

No. 211 One **HORIZONTAL MIXER** as above.

These three "U"-shaped mixers are in some cases fitted with steel plate covers and a steam jacket round the bottom and extending to within about 18 in. of the top with plain end plates.

Further details and prices upon application

Write RICHARD SIZER LIMITED, ENGINEERS CUBER WORKS HULL.

SODIUM Sulphide, Sodium Sulphite, Sodium bi-Sulphite, Sodium Sulphate, Triphenyl Phosphate, Butanol, Dewaxed Shellac, Texyn T.5, Rocrex 101, Paralac 385, Aeroclay, Soluble Starch, Ethyl Cellulose N 100 and N 200, Nulomeline. Box No. C.A. 2925, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

FOR SALE

MORTON, SON & WARD LIMITED,
—OFFER FOR DISPOSAL
HYDRO EXTRACTORS

SIX—48 in. **WATSON LAIDLAW HYDRO EXTRACTORS,** Armstrong Amazon type, 3 point suspension, driven by slipring motors, and complete with automatic airbreak starter. Tinned copper perforated cages 48 in. diam. by 22 in. deep. Each machine fitted with monel metal cover electrically interlocking. Mechanical knock-off time clock incorporated.
THREE—MACHINES to above specification, but fitted with 42 in. diam. baskets.
ONE—48 in. **BROADBENT** underdriven pitless type **HYDRO EXTRACTOR,** direct coupled to 15 h.p. motor. 3-point suspension. Lift out basket, spare basket available (new 1943).
ONE—48 in. **BROADBENT**, pit type **HYDRO EXTRACTOR,** direct coupled to 15 h.p. motor. 3-point suspension. Galvanised steel basket.
ONE—26 in. **HYDRO EXTRACTOR** by **WATSON LAIDLAW,** with galvanised steel basket, driven through fast and loose pulleys with centrifugal clutch.
ONE—26 in. **HYDRO** by **CHERRY TREE,** driven through fast and loose pulleys.
ONE—30 in. **HYDRO** by **WATSON LAIDLAW,** galvanised steel basket, driven through fast and loose pulleys, with centrifugal clutch.
ONE—30 in. **HYDRO EXTRACTOR** by **TROY,** galvanised steel basket, electrically driven through 3 h.p. motor with slipping clutch.
ONE—30 in. **HYDRO EXTRACTOR** by **BROADBENT,** with galvanised steel basket, driven through fast and loose pulley with slipping clutch. (Modern machine.)
ONE—36 in. **DITTO.**
Also—**ROTARY WASHING MACHINES** in various sizes.

MORTON, SON & WARD LIMITED,
WALK MILL,
DOBCROSS, Nr. OLDHAM, LANCS.
'Phone : Saddleworth 437

CHARCOAL, ANIMAL and VEGETABLE, horticultural, burning, filtering, disinfecting, medicinal, insulating ; also lumps ground and granulated ; established 1830 ; contractors to H.M. Government.—THOS. HILL-JONES, LTD., " Invicta " Mills, Bow Common Lane, London, E. Telegrams, " Hilljones, Bochurch, London," Telephone : 3285 East.

"G" size **GARDNER SIFTER MIXER,** 240 lb. capacity, having stainless steel trough and mixing blades 64 in. × 18 in. × 19 in. deep, complete with 2.5 h.p. A.C. motor and drive. Price, £260. Excellent condition. Box No. C.A. 2929, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

INDUSTRIAL all copper. **SOLVENT RECOVERY ABSORBERS,** by Acticarbone. Apply, **British Rayophane Ltd., Wigton, Cumberland.**

PHONE 98 STAINES

" JOHNSON " **C.I. FILTER PRESS,** 19 in. sq. recessed 13-plate type.
Twin " Z " blade Jac. **TIPPING MIXER,** 33 in. by 33 in. by 29 in. deep.
Unused 3 in. " Carrier " Elec. **CENTRIFUGAL PUMP.**
Six—1in. **B.D. MONO PUMPS, DITTO**—1¼ in.
Jac. **VACUUM OVENS AND DRYERS,** 8 ft. by 5ft., 7 ft. by 4 ft. and 7 ft. by 3 ft. diam.
Pair—Watson Laidlaw Elec. **HYDROS,** 30 in. monel baskets.

HARRY H. GARDAM & CO. LTD.,
STAINES

UNUSED **WAX EXTRACTION PLANT,** by Fraser & Fraser, Ltd., designed for Lignite, 36 tons per 24 hours.
Large **ACTIVIATED CARBON SOLVENT RECOVERY PLANT,** by Sutcliffe & Speakman. Box No. C.A. 2931, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

FOR SALE

REED

NEW **BABCOCK & WILCOX WATER TUBE BOILER, W.I.F.** type, 2-drum. Evaporation, 15,000/16,000 lb. per hour, 250 lb. working pressure. With Superheater, Chain Grate Stoker, Soot Blowers, Ash and Clinker Hoppers. Immediate delivery.
COCHRAN No. 17 VERTICAL MULTI-TUBULAR BOILER, built 1936. 14 ft. 6 in. high by 6 ft. 6 in. diam. 2,480/3,300 lb. evaporation 100 lb. working pressure. Forced draught. Weir Feed Pump. Quantity of spares.
COCHRAN No. 5 VERTICAL MULTI-TUBULAR BOILER, 9 ft. 6 in. high by 4 ft. 3 in. diam. Evaporation, 750/1,000 lb. per hour, 100 lb. working pressure.
GREEN'S HORIZONTAL GILLED TUBE ECONOMISER, 40 tubes in two banks. 260 lb. working pressure. Only used three years.

REED BROTHERS (ENGINEERING) LTD.,
Replant Works, Cuba Street,
Millwall, London, E.14.
Cables : **REPLANT, POP, LONDON.**

HYDRAULIC MACHINERY

ROSEDOWN **HYDRAULIC PUMP,** Model B.11, 3-throw, 2-stage, 2 tons sq. in., with 15 h.p. motor, 415/3/50 and Ingranic starter.
Shaw **HYDRAULIC ACCUMULATOR,** 100 tons, cast iron, weight-loaded type, with 3-throw pumps ; motor, A.C. 415/3/50, latest design.
Two Shaw **HYDRAULIC PRESSES,** 60 tons, 4 columns, platens, 3 ft. 6 in., daylight 6 ft. 6 in. As new.

COMPRESSORS

Ingersoll Rand **HORIZONTAL COMPRESSOR,** 100 cu. ft. per min. Motor, A.C. 415/3/50.
Kestner **DRYER,** 6 heated rolls, hopper feed ; size, 6 ft. by 3 ft. by 4 ft., motorised.
STORAGE TANK, 2 ft. by 4 ft. diam., ½ in. plate.

URQUHART, 1023, Garratt Lane, S.W.17.

VACUUM OVEN. Inside dimensions approx. 4 ft. by 4 ft. by 3 ft. Oven of heavily ribbed C.I. construction fitted with nine steam heated platens ; 2½ ins. daylight. Two operating swing doors fitted with four quick release handwheels to each door ; usual steam inlets, outlets, and vacuum connection. Excellent condition.

BARBERS' CHEMICAL PLANT CO., LTD.
86/88 RICHMOND ROAD, KINGSTON-ON-THAMES.
Telephone : **Kingston 1423.**

3 M.S. Welded Jacketed **PANS,** 24 in. diam. by 26 in. deep, 1½ in. bottom outlet, mounted on angle legs. Tested 100 lb. hydraulic pressure.

THOMPSON & SON (MILLWALL) LIMITED,
CUBA STREET, LONDON, E.14.
Tel. : East 1844.

6 Excellent, all welded Steel dish ended **STORAGE VESSELS,** each 37 ft. long by 8 ft. diam. by ⅝ in. plate Capacity, 14,000 galls. each.

MADEN & McKEE LTD.,
317, Prescot Road, Liverpool, 13.

8 COPPER-jacketed **MELTING PANS,** 18 in. diam. by 12 in. deep, fitted covers, mounted in M.S. frames, 25 in. by 25 in. by 44 in. high, with flanged fittings, valves and steam traps. As new.

THOMPSON & SON (MILLWALL) LIMITED,
CUBA STREET, LONDON, E.14.
Tel. : East 1844.

FOR SALE

14 Excellent equal to new, all welded steel **STORAGE TANKS**, each 19 ft. long by 8 ft. diam. by ⅜ in. plate. Dish ended type, with manhole on top. Capacity 5,500 galls. each. Immediate delivery.
MADEN & MCKEE LTD.,
317, Prescot Road, Liverpool, 13

1000 STRONG NEW WATERPROOF APRONS. To-day's value 5s. each, Clearing at 30s. dozen. Also large quantity Filter Cloths, cheap. Wilsons, Springfield Mills, Preston, Lancs Phone 2198

WANTED

WANTED REGULARLY
for treatment in our own works,
RESIDUES
containing :
Cadmium, Zinc,
Copper, Lead,
Tin, Nickel.
Offers to : **OAKLAND METAL CO. LTD.,**
Oakland Works, Willington, Derby.
Telephone No. : Repton 391/392

SERVICING

DOHM, Ltd., pulverise raw materials everywhere 167, Victoria Street, London, S.W.1.

GRINDING, Drying, Screening and Grading of materials undertaken for the trade. Also Supplier of Ground Silica and Fillers, etc. JAMES KENT, LTD., Millers, Fenton, Staffordshire. Telegrams : Kenmill, Stoke-on-Trent. Telephone 4253 and 4254, Stoke-on-Trent (2 lines).

GRINDING of every description of chemical and other materials for the trade with improved mills.—THOS. HILL-JONES, LTD., " Invicta " Mills, Bow Common Lane, London, E. Telegrams : " Hilljones, Bochurch, London." Telephone : 3285 East.

PULVERISING, Grinding, Mixing, Drying. **CRACK PULVERISING MILLS LTD.**, 49/51, Eastcheap, E.C.3. Mansion House 4406.

WORKING NOTICE

IT is desired to secure the full commercial development in the United Kingdom of British Patent No. 537401, which relates to **"FLOTATION PROCESS FOR SEPARATING PARTICLES FROM PULP MATERIAL,"** either by way of the grant of licences or otherwise on terms acceptable to the Patentees. Interested parties desiring copies of the patent specifications and further particulars, should apply to **STEVENS, LANGNER, PARRY & ROLLINSON, 5 to 9, Quality Court, Chancery Lane, London, W.C.2.**

PATENTS & TRADE MARKS

KING'S PATENT AGENCY, LTD. (B. T. King, A.M.I.Mech.E., Patent Agent), 146a, Queen Victoria Street, London, E.C.4. ADVICE Handbook, and Consultation free. Phone : City 6161.

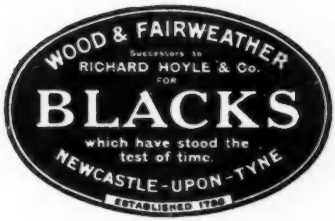
BRITISH REPRESENTATION

wanted by

Old-Established well-known **GERMAN FIRM** designing, supplying and erecting complete chemical plant, apparatus, atomisers and crystallisers and close collaboration with British firm experienced in sale representation of such apparatus and installation.

Only firms of highest standing with excellent industrial contacts or energetic and capable civil engineers should apply to:

Box No. C.A. 2928
THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.



PAINT TECHNOLOGY

with Buyers' Guide monthly, is the Journal for advertising Raw Materials and Plant to the Paint Industry.

5, GRANGE COURT, PINNER, MIDDX. Phone: HARrow 6996

Printed in Great Britain by THE PRESS AT COOMBELANDS, Ltd., Addlestone, and published by BENN BROTHERS LTD., at Bouverie House, 154, Fleet Street, E.C.4, 1 July, 1950. Registered at the General Post Office. Entered as Second Class Matter at the New York, U.S.A., Post Office.